Electrical World

McGraw-Hill Company, Inc. New York, December 10, 1921 Twenty-five Cents a Copy

McClave GRATES STOKERS STEAM BLOWERS

Four McClave Semi-Automatic Stokers, Type "M-A", in the boiler room of the Scranton Button Company, one of the very large button manufacturing concerns in the country.

4,000 Tons a Year—*Saved*

With McClave Anthracite Stokers

Burning No. 3 anthracite buckwheat under four 200 H.P. horizontal return tubular boilers, these four McClave Semi-Automatic Stokers have been saving their owners four thousand tons of coal a year since 1917.

In spite of the fact that a fine size of fuel is used, virtually no unburned coal sifts through the grates, and the calorific value of 11,653 B.T.U.'s is so well utilized that the four 200 H.P. boilers are operated continually at 200% of rating, with a saving of $44 per day of twenty-four hours over the operating cost of the previous installation of hand fired grates.

In conjunction with these "M-A" type stokers, McClave Argand Steam Blowers are used to take care of the draft requirements through the thick bed of anthracite screenings.

McClave Combustion Systems are designed to reduce operating costs in the boiler room and to produce steam at a lower cost.

If you are interested in developing worth-while plant economies, write for more information.

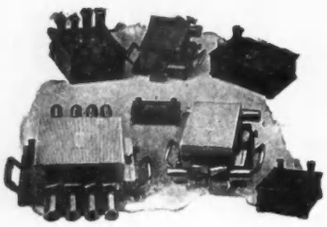
McClave-Brooks Company

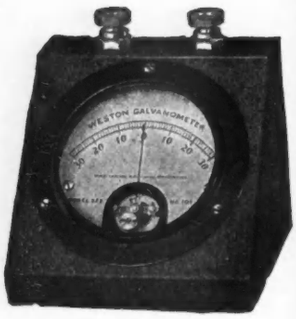
Makers of the Famous McClave Grates since 1883

Scranton, Pa.

New York: 1502 Printing Crafts Bldg.
S. C. Smith, Manager
Chicago: 515 Hearst Bldg.
F. G. Smith, Western Manager
Philadelphia: 610 Morris Bldg.
Geo. Blair, Jr., Manager
Pittsburgh: 1623 Oliver Bldg.
H. L. Hergett, Manager
Boston: 261 Franklin Street
A. R. St. John, Manager
Syracuse: 130 Hope Avenue
W. H. Goodrich, Manager
Dallas: 705 Elm Street
D. G. Counts, Manager
Charlotte:
J. C. Sanders, Manager
Jackson, Miss.: 123 Calhoun Street
W. C. Christensen, Manager
Detroit: 637 Griswold Street
A. H. Sloan & Co., Inc.,
Representative

McClave COMBUSTION SYSTEMS *for greater economy*





The Portable Testing Equipment

of the average power plant costs but a few hundred dollars.

Yet this equipment is in daily demand to protect and operate equipment and machinery that cost very large sums of money.

Have you considered—for instance—that the loss of one generating unit through improper operation, or the overloading of one large transformer may instantly cause losses greater than the entire cost of the testing instruments?

The foremost engineers consider their portable testing instruments as the most vital equipment of the plant, because continued successful plant operation absolutely depends upon precision of measurement and sufficient equipment to meet any requirement.

Weston

Electrical Instruments

are the best and most economical measurement insurance you can obtain. They are the acknowledged standards in all countries.

Thirty-three years of Weston engineering experience is at your service upon request.

Weston Electrical Instrument Co.

13 Weston Ave., Newark, N. J.

New York	Cleveland	Cincinnati	Minneapolis
Chicago	Detroit	Pittsburgh	New Orleans
Philadelphia	St. Louis	Richmond	Jacksonville
Boston	San Francisco	Buffalo	Seattle
	Denver		

Represented by Northern Electric Co., Ltd., in:

Montreal	Vancouver	Regina
Halifax	Calgary	Edmonton
Winnipeg	Ottawa	London, Ont.

Represented by A. H. Winter Joyner, Ltd., Montreal (for Power House sales only) and Toronto

And in Principal Cities Throughout the World

Electrical World

New York, Saturday, December 10, 1921

Distributing Electrical Goods

PEOPLE are particularly interested today in the great problem of distribution. Our food, our clothes, everything we use, is produced or procured for us by somebody at some far or near point, is brought to us across the intervening distance by somebody else, and finally is sold to us in our own town. The price we pay is always made up of three parts—the cost of producing, the cost of transporting and the cost of local selling. So with everything we purchase we spend some of our money, not for goods, but for delivery.

But that is all right, for every value is based on the location of the goods and every price conditioned on where they are sold. And nothing is worth buying unless it can be laid down where we want it. Therefore the so-called "middleman" who passes things along, though he has added to the cost of goods, has added also to their value, and his cost and service have been essential ones. Yet, with the growth of industry, the numbers and variety of distributers have grown into questionable complexity, and we have today in the electrical business this many-linked chain:

The producing manufacturer,
The association jobber,
The non-association jobber,
The agent jobber,
The manufacturer's branch office,
The manufacturer's agent,
The electrical contractor,
The electrical dealer,
The hardware, drug and department store,
The central-station merchandising department,
The consumer of the goods.

Ranged between the producer and the consumer of electrical commodities there are nine different kinds of distributing agencies that operate in different ways with different classes of goods to perform the two functions of wholesaling and retailing. Not all of these, of course, function in any one transaction, but always one or two. These men gather the assorted lines from scattered factories and present them in convenient combinations, where the purchaser may buy them easily. Each manufacturer uses the kind of distribution that he likes the best. Each distributer sells the kind of goods that he prefers. But which electrical distributer performs his economic function best? Nobody knows.

The nation has awakened to the fact that too much work and money is being wasted in our traditional system of distributing foodstuffs. It is ruining both the farmer and the householder. And the country has decided that something must be done. The problem before electrical men is very similar. It must be studied and worked out.

We *ought* to know which form of distribution pays. We *should* have standards under which distributers would qualify. For goods must be marketed with both the price and profit right to all if present troubles are to end.

Harvey Hubbell

Inventor and manufacturer who has played a conspicuous part in the perfection of electrical schedule material and machine tool operation.

DOMESTIC use of electricity began in the early eighties and spread like wildfire, but in those days had to contend against the popular feeling that, while a wonderful servant, it was nevertheless a dangerous one. Many persons had been badly shocked because of poorly insulated switches, or sockets, or other fittings. Thus it is seen that schedule material, while comparatively small as an individual item, has played a really significant part in the growth and development of the electrical art. Better and more easily operated switches and plugs have made the domestic use of electricity more appealing. To a large degree the credit for developing schedule material along these lines must go to Harvey Hubbell, head of Harvey Hubbell, Inc., of Bridgeport, Conn. More than a hundred patents, not all for schedule material, however, have been granted him. He is credited with the origination of the pull-chain socket-switch mechanism and several different attachments for its use. Among other patents are those for converting key or keyless sockets into pull-chain sockets, the double-T plug, T-cap and three-point shade holder. He has developed a locking lamp to prevent theft. He is also credited with seeing the value of the English toggle switch and of bringing it to this country and perfecting it.

Mr. Hubbell is, in addition, a leader in the machinery field. He was the first to make rolled-thread machine screws with automatic machinery, and a large part of his company's plant is given over to this department. He is the inventor and manufacturer of a tapping machine.

Week after next Mr. Hubbell will celebrate his sixty-fourth birthday. He was born in Brooklyn, N. Y., Dec. 20, 1857, and received his mechanical and technical education at Cooper Institute in New York City. He obtained his early factory training with builders of printing presses and in ship and marine engine works. Having patented one or two articles, he started in 1888 to manufacture them in Bridgeport, Conn. Not long afterward he became interested in electricity and, seeing the need for wiring materials, he bent his inventive mind in that direction. As the field expanded he began to devote more and more time to this work until he now heads one of the largest schedule-material manufacturing organizations in the country. Mr. Hubbell still spends a large part of his time in developing and improving various items of schedule material. He virtually acts as factory manager and financial head of the company. One other reason why he has been so successful is because he is keenly interested in employee relations and has spent much time in perfecting a spirit of good fellowship and loyalty in the company.

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician
Published by McGraw-Hill Company, Inc.

W. H. ONKEN, JR., and D. H. BRAYMER, Editors

CARL E. WHITEHORNE, Commercial Editor
S. B. WILLIAMS, Assistant Managing Editor
A. M. PERRY, Engineering Editor
J. C. MARTIN, Western Editor
G. E. ARMSTRONG, Pacific Coast Editor
H. S. KNOWLTON, New England Editor

Associate Editors: E. H. HUBERT T. P. KINDIG R. M. DAVIS H. H. STINSON F. C. WELLS

Volume 78 New York, Saturday, December 10, 1921 *Number* 24

People Understand the Grocery Business— Why Not That of the Central-Station Company?

COMPETITION by the chain store has brought many changes in the conditions of the drug and grocery businesses. Little "cash-and-carry" shops in some communities have virtually driven many old and well-established grocers out of business. The public has shown a keen interest in the situation, and it has often been the subject of discussion in every household. For the public understands the grocery business, and it is generally intelligent and sympathetic in its judgment of the retail merchant.

The grocery store is a simple, old, traditional institution with which the public has been in close contact for generations. The central-station company, however, conducts a business that is of more recent origin and one complicated by conspicuous technical features with which the public is not acquainted. Here is a basic reason, therefore, why the central-station company has been so often misunderstood. The business aspect of public utility service must be emphasized by friendly human contact between the utility employee and the customer that will eventually make the public understand that, after all, the central-station business is just like any other retail business, though selling, not food in bags, but light and heat and power through wires. This thought must be instilled into all employees to carry to their friends and to the customers whom they serve, so that in time the public will become accustomed to the electric service business also and will understand it.

What the Figures Show About Tariff Retaliation

SOME people say that if America establishes a higher tariff foreign countries will retaliate and build a wall against our goods. Apparently these objectors have not seen the figures. For last year Canada collected $19.50 in import duties for every man, woman and child in the Dominion. Great Britain, heralded the world over as the great free-trade country, collected $16.50 per capita. We collected but $3.15. There is a margin, and a wide margin, therefore, between the plane of our present tariff imports and the point where friendly foreign countries might be expected to rise in their wrath and smite us back.

One year under the Payne tariff law we received imports totaling $1,812,000,000—the greatest in our history—on which we collected duties totaling $331,000,000. Last year our imports were $5,300,000,000, and we charged exactly the same amount—$331,000,000—or but one-third the duty. At the present time we have the lowest tariff against importations imposed by any principal country on the face of the earth, and this we have had since 1913. The fear of a blighting retaliation against our exports is therefore absolutely unfounded.

And we must remember also that our exports figure as only 10 per cent of our production. We might even well afford to risk it, if need be, for the protection of the nearly 90 per cent of our production which is for domestic business.

A higher, more protective tariff is needed, and needed now, unless our markets are to be flooded with German and Japanese goods at prices far below our factory costs. For if American labor is to have employment, we must be able to sell the goods that it produces. And if we cannot sell our goods at home in our own markets, and our factories close down and our people have no work, of what use are the cheap importations anyway, when there is no money to buy them at any price?

Already electric motors, heating appliances and other goods are coming in at prices unapproachable. An adequate protective tariff supported by the American valuation plan is absolutely vital to the electrical industry. The whole country suffers for the need of it.

Recent Sleet Storm Teaches Operatives and Public Valuable Lesson

THE recent sleet storm which put out of service the wire systems of a considerable portion of northern New England impressed a series of valuable lessons on operatives and the public. Especially around Boston the wreckage was of the most disastrous kind and, despite the utmost diligence, some of the service is even yet unrestored. Perhaps the most striking thing demonstrated was the dependence of the community upon its electrical utilities—power, light, telephone and telegraph. Two million people went peacefully to bed on Sunday in the year of grace 1921 and woke up Monday morning about A.D. 1881, without light or power or the now ordinary means of communications, and the two million, being dependent on the butcher, the baker and, especially, the candlestick maker, had to hustle for necessities after the manner of their grandfathers.

The strenuous efforts of the electric light and telephone companies to overcome the calamity beggar description. Every available man had to take hold with both hands and help clear wreckage. And very curious wreckage it was. Power and light wires held up well unless actually carried down by main force. Telephone and telegraph wires, lighter and often much older, suffered very heavily. When circuits ran through trees they stood little chance against the crashing branches.

What it all signifies it is not easy to say. It is hardly practicable in a scattered suburban territory like that which surrounds most American cities to put all wires underground, certainly not until very different installation methods are available. Overhead power circuits clear of destruction by trees have again proved their reliability. It is in the primary and secondary distribution where trees are plentiful that the main trouble is encountered. One is tempted to say a word for the

policy of running wires, not on streets, but on the rear lines of lots wherever possible—something akin to the alley distribution which has here and there worked well. If the obtaining of rights-of-way were made legally simple, it would be feasible in many places to keep off tree-lined streets almost entirely, so that wholesale destruction of lines would be very unlikely. The situation shows the importance of working out schemes of distribution to take account of just such contingencies as put back the almanac about forty years last week. Distribution systems have "just grown," and the time is ripe for some general efforts at co-ordination.

Municipal Utilities Need Commission Control

MUNICIPALLY owned utilities should be controlled by the public utility commissions for exactly the same reason that the privately owned utility is. As a basic proposition the municipally controlled system is subject to all the mistakes of operation and policy that private ownership may be charged with. Its management as an average cannot be said to be free of the selfish aims that other managements may be cursed with. In short, eliminating politics, the municipal utility is much the same in characteristics as any other organization made up of human beings.

If privately owned utilities must be regulated to control the evils of which they may be the victims, there is no argument that will free the municipal utility from the need of the same control. As a matter of fact, the management of the municipal utility has the opportunity not only to indulge whatever evil propensities it may have, but they may be indulged behind a screen of political jealousies, ambitions and selfish aims that is the most effective barrier to real knowledge by the owners of what is taking place. Here lies ample reason why there should be some competent, unprejudiced body that can hold a check rein on the acts of the municipally owned utility. The evils enumerated by Edwin O. Edgerton elsewhere in this issue are the most obvious ones that arise in the lack of such control, and while they should receive careful attention, the basic reasons why they exist and the fact that municipally owned utilities are in no fundamental sense free from possibility of corruption should be brought home to the public. Less of heated discussion and more of calm consideration will help to bring the solution.

Precedent Observed Too Closely in Building Rural Lines

LONG spans on the lines carrying a limited number of wires for irrigation or other rural service have long been an accomplished fact in the West, where climatic conditions have not been so severe as those in the Middle West and East. The heavier high-tension lines in the Eastern territory, particularly those using steel towers, have employed long spans, but there has been a fear of applying the practice to the lighter distribution lines where savings in investment cost are obvious if the practice should prove successful. Some individuals a little bolder than others have dabbled with the longer spans in the Eastern territory, but the Empire State Gas and Electric Association has boldly overstepped precedent and its sub-committee on standard construction for farm lines has issued a tentative specification for such construction as a guide to the members. A saving of almost one-third with an average span of 250 feet as against one of 125 feet is shown in the cost figures submitted. This is one matter on which precedent has cut entirely too large a figure. The limiting factors on the span lengths that can be used are the number of wires carried, the transverse stresses under the weather conditions encountered and the clearance of wires from the ground in the center of the spans. Another factor that must receive consideration appears when sags become great enough to require excessive cross-arm spacings or make the lines themselves objectionable in other ways.

The number of wires on the average rural line is small enough for wood poles to have ample strength, and the conductor stresses can be controlled within rather wide limits by adjustment of sags. There is no reason why the most should not be made of these opportunities to reduce the original costs of construction, particularly when the poles can be so spaced that if the number of conductors ever becomes great enough to justify shorter spans, the problem can be met by setting another pole in the middle of each span. The whole problem is one of intelligent design of lines to meet the conditions under which they must operate and of the avoidance of practices that have been developed to meet wholly different conditions.

Knowledge of Ultimate Nature of Electromagnetic Phenomena Essential

EVERY trained physicist and electrical engineer who knows the basic facts regarding electromagnetism and electromagnetic induction usually can foretell the results of any particular combination of electric circuit and magnetic field which may be suggested. However, when the attempt is made to write statements of these fundamental laws in terms of the concrete structures constituting electric and magnetic circuits, difficulty is found in so expressing these statements that they will cover all possible forms and combinations of circuits. The trouble lies in the fact that we must speak of electric circuits and magnetic fields when we really have not a complete knowledge of the nature of either. As a result, in the case of virtually every existing statement of the laws of electromagnetism and electromagnetic induction, it is possible to point out some particular experiment or phenomenon which would seem to be in direct violation thereof. Perhaps the best known instance of this is found in the ordinary statements of the law of electromagnetic induction. The induced electromotive force may be defined in terms of the total change in magnetic flux through the electric circuit or in terms of the rate of passage of a portion of the electric circuit through the magnetic field. All known instances of induced electromotive force can be explained in terms of either one or the other of these conceptions, but neither one embraces all.

In the November issue of the *Journal* of the Franklin Institute Dr. Carl Hering presents an interesting collection of these apparently "outlaw" experiments and phenomena. Several of them were presented a number of years ago to the A. I. E. E. and elicited an extensive discussion of the law of electromagnetic induction, from which there emerged a general consensus of opinion that in any statement of this law the fundamental principle should involve the passage of the material substance of the conductor across the magnetic field, or vice versa. This is quite in line with modern theories of the ultimate nature of the phenomenon as discussed by Lorentz

and others. These theories take their start from the interaction of the magnetic field and the electrons within the atoms of the conductor. They apply equally well to conductors and dielectrics and take due account also of the displacement currents in dielectrics, first suggested by Maxwell, which may also be set up by electromagnetic induction.

None of these freak experiments casts any doubt on the validity of the laws as we now know them. For example, practically all of the experiments on the mechanical interaction of electric circuits, including the pinch effect as described by Dr. Hering, may be explained in terms of one fundamental physical principle, that the potential energy associated with an electric circuit is the product of the strength of current in it and the magnetic flux threading it in a negative direction. This is the electrical law which is the parallel of the mechanical analogy employed by Dr. Hering.

In spite of the firmness of the foundations of these laws and of our wide knowledge of a number of curious outstanding manifestations, it remains true, as Dr. Hering points out, that we have no universal and all-satisfying statements of the laws. This problem has for a long time engaged and is still engaging the thoughts of leading physicists. It appears that complete and accurate statements covering all possible cases can come only from a more complete knowledge of the ultimate nature of the phenomena involved.

Careful Cost Accounting Shows Electric Truck Economies

NINE years of electric truck service under careful cost accounting yield very interesting data on economic performance. Such an analysis is presented in this issue of the ELECTRICAL WORLD by Walter R. Metz of the Government Printing Office. Eight electric trucks have been operated under the author's supervision at Washington through the entire period, with two more added three years ago. The capacities range from 1,000 lb. to 10,000 lb., and the units are all in service today, energy being obtained at from 1.25 cents to 2 cents a kilowatt-hour. The largest-size truck has been in service three years, but no battery renewal expenses have been imposed upon Uncle Sam so far. The other units range in over-all expenses, less drivers' wages, from 17.53 cents to 41.2 cents per mile for duties ranging between 54,600 miles and 30,419 miles.

The operating costs and fixed charges tabulated by Mr. Metz might well stand by themselves as detailed evidence of the value of electric truck in city service; for whoever figures the corresponding costs of gasoline truck performance will have no easy task to approach these outlays. The author has strengthened his paper materially by including for comparison actual costs of gasoline truck operation from the government fuel yard and postal services, together with some significant data from private practice.

Intelligence in selecting electric trucks for particular services is of more importance than used to be thought the case in many quarters, but, given areas of moderate size requiring a total daily run of about 20 miles to 40 miles, moderate speeds, rapid accelerations from standstill and slowdown and with reasonably good highways, the prospects of the electric truck winning the day over both horse and gasoline traction are excellent indeed. It is unfortunate from some points of view that it is seldom possible to compare the over-all costs of identical services before and after electrification; but as increased outputs generally follow the application of electricity to every branch of business and production, the lack is not so serious after all. Altogether too few users of electric trucks, whether for road or industrial plant service, maintain records as complete as those printed here, and we hope that their publication will stimulate other users of such equipment to put their accounting houses in order and share the results.

New Hartford Station Reflects Credit on Owners and Designers

TO MAKE provision for carrying increasing loads with the least possibility of interruptions is a large enough problem in itself for central-station managers, but when this duty is combined with the development of a plant efficiently to fit into regional systems of energy supply, the engineering problems involved are particularly intricate. The new South Meadow station of the Hartford (Conn.) Electric Light Company, described with relation to its mechanical equipment elsewhere in this issue, illustrates a problem solution of this type. For twenty years the Dutch Point steam plant of this company has met the chief load requirements of the Hartford system, growing in that period from 6,000 kw. to 36,000 kw. rating. It is now supplemented by the new station, designed to function acceptably as a key plant in giving either local or regional service.

Ample provisions for expansion, centralized boiler-plant control, excellent fuel storage and supply, water supply and facilities for high-tension structural development characterize the South Meadow plant. It is designed for an ultimate capacity of 130,000 kw., although this can be greatly increased without crowding the site. One 25,000-kva. unit is now in service, with a second on order. Four water-tube boilers equipped with integral economizers and underfeed stokers compose the present steam-generating equipment, and the design provides for a subdivision of coal-handling plant and auxiliaries which doubly insures reliability and economy of operation. Great care has been taken in this installation to avoid needless expenditure for excessive piping and wiring runs. Steam-driven apparatus is located near the boiler installation and electrical equipment toward the electrical bay or else within it. Apparatus of all types will be operated under daylight conditions to an unusual extent. The closed system of generator ventilation has been adopted, with provision for quick transfer to the open system in emergencies; special attention has been given to conserving heat units in carrying the condensate and make-up water to the boilers, and the heat balance has been carefully considered in relation to plant development, with the result that no house turbine was provided. Both electric and steam drives are used in the auxiliary equipment service, yielding a highly desirable flexibility.

Solidity of design, avoidance of "frills" in equipment, a plant layout of complete symmetry, potential development by unit groups of apparatus, liberal clearances, and withal a low unit area and volume, are features of this station. In architectural appearance the initial structure happily avoids the "sawed-off" effect frequently found in "nucleus" plants and is a building of attractive aspects. Orthodox in equipment selection, straightforward in arrangement and clearly adapted to render efficiently both local and regional service, this station reflects credit upon those responsible for its design and takes immediate rank among the notable installations of the year.

New Pacific Gas & Electric Line Which Will Operate Eventually at 220,000 Volts

ONE CIRCUIT of the new Pit River line of the Pacific Gas & Electric Company, which will ultimately operate at 220,000 volts, has been completed from the two Hat Creek plants to a point near Red Bluff. At present it is operating at only 60,000 volts, but it will later be energized at 110,000 volts and eventually converted to 220,000 volts. Aluminum conductor having 500,000-circ.mil cross-section is used in the mountains and copper in the valleys. While only one circuit has been installed, right-of-way has been cleared for two lines. So far steel towers have been provided only at dead-end or anchor points. The wood poles between them will be replaced by towers as soon as their butts decay.

New Hartford Station Has Superpower Characteristics

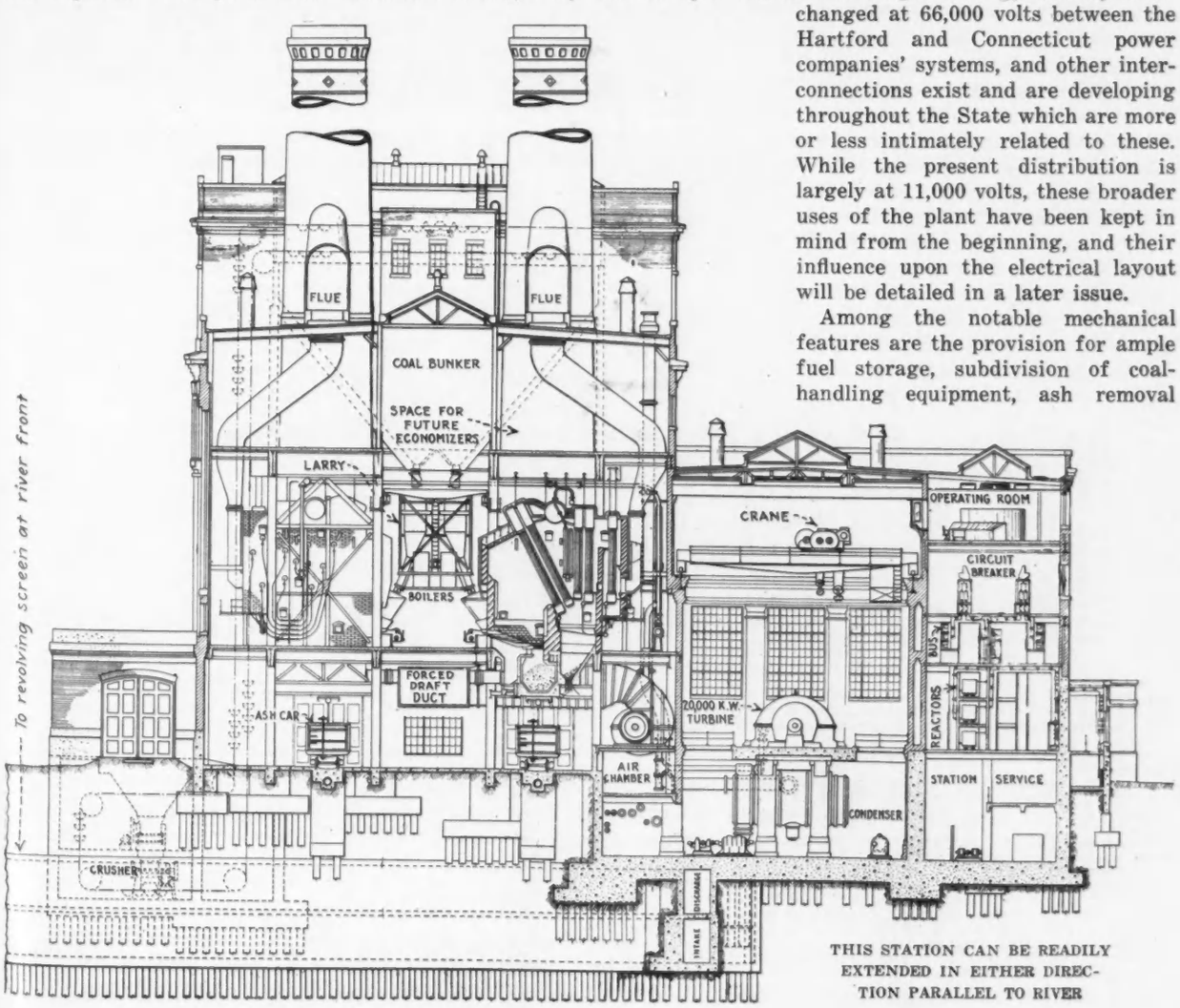
Provision for Simultaneous Development for Local and Regional Service Is Dominating Feature of the South Meadow Plant—Boiler Plant Illustrates Advances in Co-ordinated Control of Operation—Designed for 130,000 Kw. Ultimate Capacity

CONSPICUOUS among the latest additions to the central stations of New England is the South Meadow station of the Hartford (Conn.) Electric Light Company, which is designed as a "key plant" in relation to local and regional interconnections present and prospective and combines to an unusual extent symmetry of arrangement, avoidance of equipment congestion and adherence to apparatus of demonstrated necessity. In twenty years the well-known Dutch Point steam plant of the company has risen in rating from 6,000 kw. to 36,000 kw., now the economic limit of its expansion. During the war the necessity of building a new plant for handling future loads was forecast, and in 1917 a 50-acre tract bordering the Connecticut River about a mile south of Dutch Point was acquired. Two years later Stone & Webster, Inc., of Boston, were instructed to undertake the design and construction of a new plant. Construction soon began, and the new plant will be opened officially on Dec. 19, 1921.

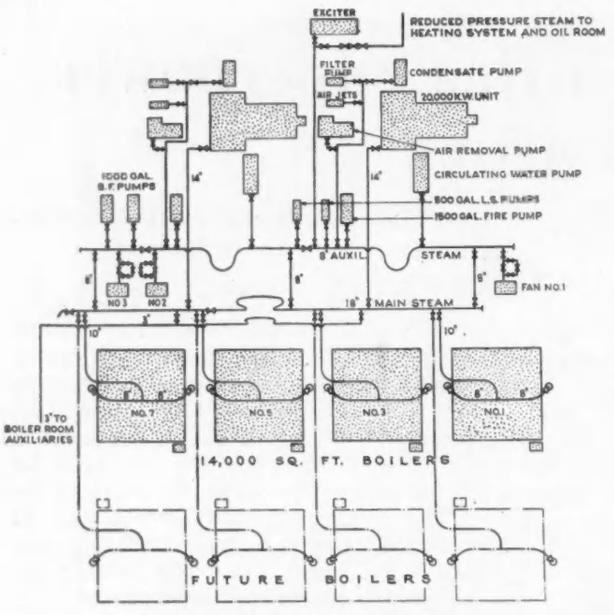
An ultimate capacity of 130,000 kw. in five units is contemplated in the new plant, but this rating can be extended to 260,000 kw. without difficulty owing to the site available. Two 20,000-kw. turbo-generators and four 1,400-hp. boilers have been purchased. Sixteen boilers of this size are contemplated for the ultimate station, which is readily adapted to "superpower" service as well as planned to supply the Hartford district at high efficiency. The guaranteed turbine water rate at the point of best loading is 10.1 lb. per kilowatt-hour.

The necessity of twofold service—local and regional—constantly controlled the design. Energy is today interchanged at 66,000 volts between the Hartford and Connecticut power companies' systems, and other interconnections exist and are developing throughout the State which are more or less intimately related to these. While the present distribution is largely at 11,000 volts, these broader uses of the plant have been kept in mind from the beginning, and their influence upon the electrical layout will be detailed in a later issue.

Among the notable mechanical features are the provision for ample fuel storage, subdivision of coal-handling equipment, ash removal



THIS STATION CAN BE READILY EXTENDED IN EITHER DIRECTION PARALLEL TO RIVER



SIMPLIFIED PIPING IS A FEATURE

boiler-plant units and auxiliary apparatus to insure minimum interruption of service and economical operation through proper loading. Centralized boiler-plant control from a room specially assigned and equipped for this purpose is another feature of advanced design in this plant. Very thorough study of the question of heat balance was made in connection with the choice of auxiliaries, and reliability of service without excess investment in piping systems also received careful attention. The closed system of ventilation was adopted for the generating units with provision for fire extinguishment by carbon-dioxide gas under pressure.

A pleasing exterior* has been attained in the use of a red brick with precast concrete trimmings, the structure being of the steel-frame type with concrete foundations supported by piling. Dull-shaded enameled brick is used in the turbine room to avoid glare, while the turbine platform and condenser floor are of red quarry tile laid in squares. The present boiler room is 205 ft. long by 67 ft. wide, the turbine room being 203 ft. long by 55 ft. wide. Three turbines can be housed in the present structure. The present building has a ground area of only 0.57 sq.ft. per kilowatt, and in the ultimate station this will be reduced to 0.54 sq.ft. The cubical contents are 60 cu.ft. per kilowatt and ultimately will be 56.

A boiler house with central crosswise overhead bunker, an adjoining turbine room and beyond an electrical bay on the side away from the river, and on the opposite side of the station a coal-handling bay and intake and discharge tunnels make an excellent layout. The auxiliaries are installed in very accessible open spaces on the condenser floor. Variations in the river stage reaching a maximum of 30 ft. necessitated placing the condenser floor 20 ft. below high water and waterproofing the portion of the turbine room below that elevation. As the turbine floor is virtually a platform only 4 ft. wide along each side of the units and 15 ft. wide between their ends, ample light reaches the auxiliaries from above.

The boiler room floor is 21 ft. above the turbine floor and 27 ft. above the ash room floor, thus affording ample space beneath for the forced draft and the ash-handling equipment. The ashes are removed by standard gage railroad cars from hoppers below the stokers. The hoppers are brick lined and will hold twenty-four hours' accumulation. There are no boilers under the coal bunker, this space being utilized by heaters, water-treatment equipment, elevators and other apparatus.

The usual double row of boilers is planned, with a firing aisle 13 ft. 6 in. wide between stoker ends. Excellent light and ventilation result from the spread between boiler fronts.

Coal is handled by rail from ground storage or direct from cars to receiving track hoppers at the river side of the boiler house. Each hopper is rated at 140 tons per hour capacity. Space is available for handling coal by barges in future. From the hoppers the coal is conveyed to either of two 36-in. x 48-in. double-roll crushers

*Station is within 1.5 miles of center of city.

Data on Principal Equipment in South Meadow Station of Hartford Electric Light Company

Boilers and Allied Equipment:
Boilers (Bigelow-Hornsby), heating surface, 13,920 sq.ft.; ratio of heating surface to grate area, 49 to 1; furnace volume, 6,370 cu.ft.
Economizers (Bigelow-Hornsby); integral part of boiler; heating surface, 2,750 sq.ft.
Superheaters (Foster); heating surface, 6,250 sq.ft.; superheat, 225 deg. Fahr.; total steam temperature, 640 deg.
Stokers (Sanford-Riley); sixteen-retort, extra-long underfeed; geared Terry turbine and four-speed General Electric motor.
Ash gates (Baker-Dunbar-Allen).
Forced-draft fans (Sturtevant), 200,000 cu.ft. per minute, Westinghouse geared turbine.
Control for forced-draft fans, and stokers (Hagan).
Stack, one (Heine) concrete; 15.5 ft. inside diameter at top by 215 ft. above grates.

Coal Handling:
Coal-storage crane (Ohio Locomotive), 20-ton, 50-ft. boom.
Coal conveyors and crushers (Stephens-Adamson), 130 tons per hour.
Larry (McCarthy Brothers & Ford), weighing type, 15-ton.

Feed Water:
Feed-water heaters (Cochran), open; 540,000 lb. per hour.
Boiler-feed pumps (Jeansville-Worthington); two 1,000-g.p.m. three-stage and one 500-g.p.m. four-stage; (Terry) turbine drive.
Water filters (International); two sand-pressure type; 250 g.p.m.

Prime Movers and Auxiliaries:
Prime movers (General Electric), two 20,000-kw. (and three 30,000-kw. ultimately); 1,800-r.p.m.; 250-lb. steam pressure; 10.1 lb. steam consumption at 14,000 kw. and 29-in vacuum.
Oil filtration (Richardson-Phenix), continuous type.
Condensers (Westinghouse), 30,000 sq.ft.; (Chase) Muntz metal tubes; Fort Pitt Springs.
Circulating pumps (Westinghouse); 18,000-g.p.m.; driven by one motor and one turbine.
Condensate pumps (Worthington); 450-g.p.m.; driven by one motor and one turbine.
Air pumps (Le Blanc), two-jet single-stage; driven by Westinghouse turbine.
Intake screens (Link-Belt); sluice gates and hoists (S. Morgan Smith).
Air conditioner (Carrier), closed-system; water spray, 60,000 c.f.m.; horizontal supply pump and vertical discharge pump (Worthington); 500 g.p.m.
Station crane (Northern Engineering); 100-ton; five-motor.

Accessories, Instruments and Supplies.—Damper control (The Engineer); feed-water regulators (Williams); safety valves (Consolidated); blow-off valves (Yarnall-Waring and Everlasting); Venturi meters (Simplex); steam flow meters (General Electric); recording instruments (Foxboro); indicating instruments (Star); indicating thermometers (Tagliabus); CO_2 recorders (Uehling); master steam gage (Ashton); draft gages (Precision); stoker speed tachometer (Brown); fireclay and brick (Queens Run); brick and cement (Carborundum); Sil-o-cel blocks (Celite); Adamant fire cement (Batfield); Apexior boiler paint (Dampney); furnace side wall ventilation (Bernitz).

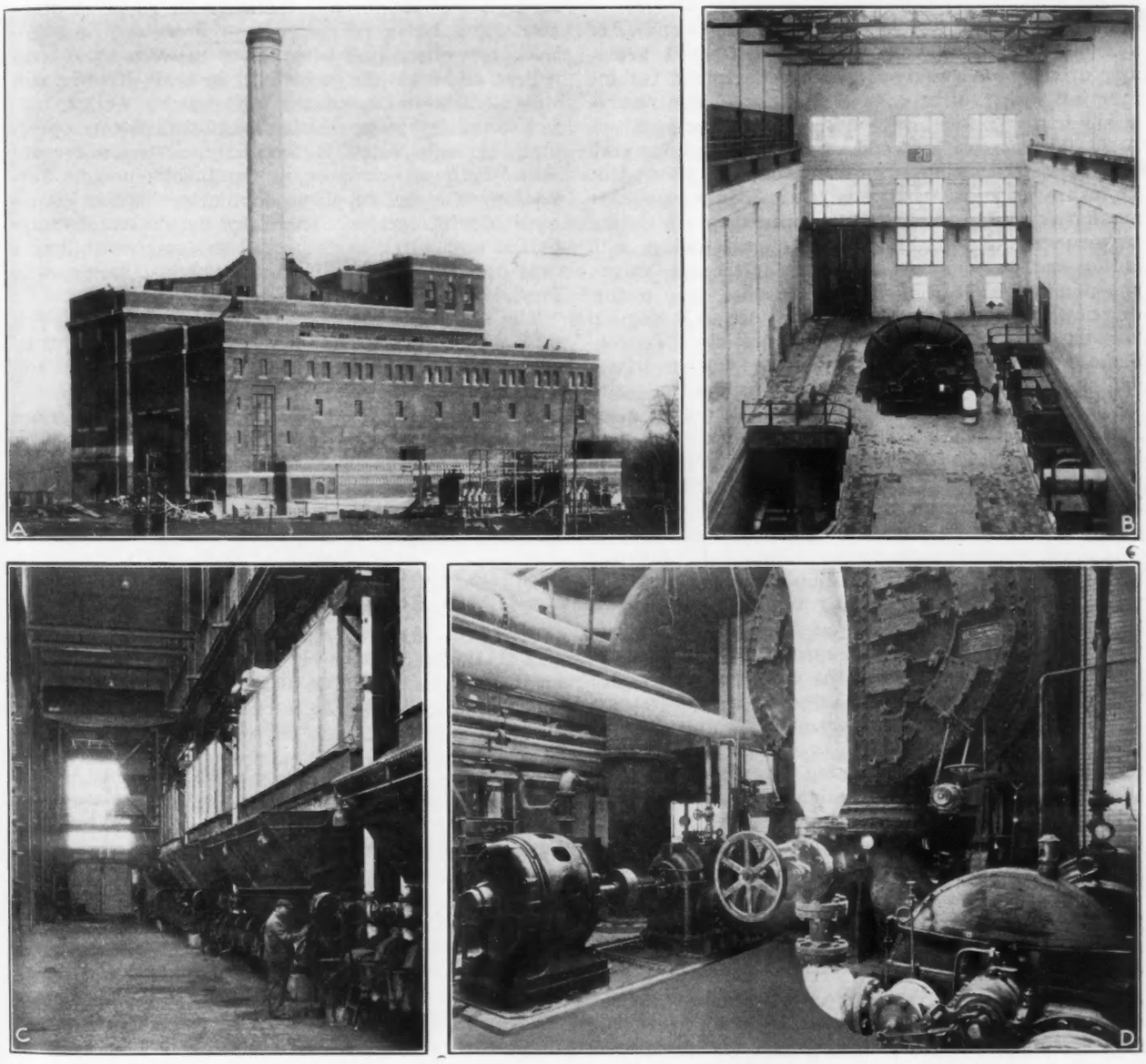
Piping, Valves, Coverings, Etc.—High-pressure semi-steel pipe and fittings (Lumsden & Van Stone); atmospheric exhaust piping (Abendroth & Root); cast-iron circulating water pipe and fittings (Lumsden & Van Stone); miscellaneous cast-iron pipe and fittings (Pittsburgh); ventilating sheet-metal work (Delbrook); pipe covering (Collins-Lotz); Holly drip system (Hodson); expansion joints (Westinghouse and Badger); miscellaneous valves (Edward, Pittsburgh, Warren-Webster, Pratt & Cady).

Miscellaneous Pumps (Worthington) with (Terry) turbine drive in part, viz., two single-stage 500-g.p.m. service pumps, one 1,500-g.p.m. fire pump, two 300-g.p.m. clean-drip pump, two 100-g.p.m. dirty-drip pumps; two intake well pumps. The last three sets are motor-driven.

of 130 tons per hour capacity each, and thence by either of two bucket elevators of this capacity to the bunker, which holds 1,850 tons. Only one set of coal-handling equipment is included with the first installation. Induction motor drives with interlocked controls to insure starting and stopping equipment in proper sequence are provided. A motor-driven traveling weighing lorry distributes coal to the stokers.

Each boiler is equipped with an integral economizer retort underfeed stoker with 286 sq.ft. area is provided for each boiler, with combination steam turbine and motor drive and multi-speed control. Two forced-draft fans with a capacity of 200,000 cu.ft. per minute supply air to the furnaces. Six fans will be required in the ultimate station. Fans are installed in forced-draft supply chambers below the boilers and are driven by turbines installed in the turbine room.

For every four boilers a concrete stack 15 ft. 6 in. in-



OUTSIDE AND INSIDE THE SOUTH MEADOW STATION

A—Viewed from the electric gallery side and looking toward river. The building area is only 0.57 sq.ft. per kw. B—One of the 20,000-kw. turbo-generators; areaways in floor afford ample light to auxiliary room below. C—Looking down row of 1,400-hp. boilers having centralized control. D—Steam and electrically driven circulating pumps in well-lighted space.

of about 20 per cent of the boiler-heating surface, placed in the rear of the setting, and also with a superheater of 6,250 sq.ft., designed to give 225 deg. Fahr. at 200 per cent rating. The steam pressure is 275 lb. The furnace volume is 6,370 cu.ft. or 22.2 cu.ft. per square foot of grate surface. The furnace walls are perforated to prevent clinker formation, and the bridge walls are faced with carborundum brick 24 in. high, opposite dump plates, to resist abrasion by clinkers. A sixteen-side diameter and 210 ft. high above the grates is required. The boiler uptakes discharge into horizontal flues run uninsulated along the roof and terminating at the stack. Space is available for the installation of induced-draft fans above the boilers and just below the roof in case separate economizers are installed, such fans then becoming essential to secure the draft required at high ratings. The uptake dampers for each boiler are automatically regulated.

Centrally located with respect to the ultimate station will be a room for auxiliary and combustion control equipment with indicating and recording instruments for measuring pressures, temperatures, steam flow, carbon-dioxide and kilowatts, and including automatic control equipment for forced-draft turbines. This arrangement brings the operation of the various pieces of auxiliary and combustion equipment under the observation and control of one man and enables him to maintain the proper heat balance at all times.

Each of the first two generating units is composed of a 25,000-kva., 11,000-volt, three-phase, 60-cycle generator driven by a twenty-three-stage horizontal turbine equipped with a direct-connected exciter. One reserve steam-driven exciter has been provided for present use. A 30,000-sq.ft. surface condenser is provided for each turbine and is mounted beneath it on spring supports. To insure economical and reliable service the condenser auxiliaries are in duplicate, including two circulating water pumps of 18,000 gal. per minute rating with bottom-suction and motor-operated discharge valves, one pump being turbine-driven and the other motor-driven. One pump is sufficient to produce an economical vacuum most of the year. There are also two condensate pumps per condenser, motor and turbine-driven, and either is of sufficient capacity to handle the entire load, and a hydraulic air-pump and a two-jet air exhauster. The relatively small initial installation at South Meadow and uncertain rate of plant growth precluded the use of a house turbine in connection with heat-balance requirements on account of its first cost.

The closed system of generator air cooling is used at this plant, 55,000 cu.ft. of air per minute being required per unit. The chamber for continuous recirculation and water spraying is located under the generator end of the turbine foundation and is of brick and concrete to eliminate noise. Two sets of sprays are provided, one in the uptake to each end of the generator. Increased space, reduced air velocity and a flexible damper arrangement result from this arrangement. Turbine-room air can be recirculated if desired, or in cold weather generator air can be used in warming the turbine room and in cutting down roof condensation. In case the water pressure fails, interlocked dampers permit a rapid change to an open system of ventilation. River water is normally used for cooling and for boiler feed.

Rounding up the Heat Units

After passing through the turbine oil coolers and the condensers for the steam air jets, if the latter are in service, the prime-mover condensate discharges into an overhead surge tank. Make-up water is added by float control from the service tank. The water flows from the surge tank to the heaters under float control and reaches the pumps under 50-ft. head. An emergency cold-water connection to the feed pumps from the circulating water tunnel is provided. Duplicate boiler-feed discharge piping is furnished, and the service tank is designed to separate filtered from unfiltered water, eliminating the interference of unusual house-service requirements with power-service needs.

Feed-water heaters, tanks and pumps are placed under the coal bunker, the tanks including a 20,000-gal. oufit on the roof and a 5,000-gal. surge tank under the bunker. Two 12,000-hp. open feed-water heaters, one 500-gal. and two 1,000-gal.-per-minute feed pumps are provided. Space is available in the plant for future evaporating equipment for make-up water and for air-removal equipment.

Welded nozzles of the interlocking type and line welds of the telescopic type are used on the main high-pressure piping, which has cast-steel fittings and valves.

Minimum duplication has been sought in the piping layout, but sectionalization has been required for operating convenience, together with symmetrical arrangement. Each boiler has two 8-in. outlets connecting through a 10-in. line to a main header 18 in. in diameter. The latter is run near the boiler-room floor level, is sectionalized with valves between every four boilers, and feeds the turbo units by leads of 14 in. outside diameter taken off the top, one per section. An 8-in. auxiliary steam header, sectionalized correspondingly to main units, is accessibly located under the forced-draft air chamber in the turbine room. Subdivision of steam supply to auxiliaries further insures continuity of service. There are no unusual features in the circulating-water tunnel system, which has a capacity of 70,000 kw. in the initial installation, with provision for extension as required.

The impression received on entering the building is its compactness and simplicity of arrangement. Adequate space has been provided despite the low unit areas and volumes given.

Features of the electrical equipment will be described in the next and concluding section of this article.

The information upon which the foregoing description is based was obtained through the courtesy of T. H. Soren, vice-president Hartford Electric Light Company, and from the engineers of Stone & Webster, Inc.

Spain Adopts Electrical Standards

ANNOUNCEMENT comes from Commercial Attaché C. H. Cunningham, at Madrid, that a royal decree has been issued by the Ministry of Fomento arranging for the adoption of legal electrical standards, as follows:

I. The legal units for the measurement of electric power in Spain shall be founded upon the electromagnetic system, adopting as basis units for resistance the international ohm and for intensity of current the international ampere.

II. The Minister of Fomento, consulting with the permanent Spanish Commission on Electricity, shall dictate the necessary regulations for the application of this decree, which shall comprise the following:

(1) Specification of the two above-mentioned primary units in accord with international regulations.

(2) Definition and specification of all the other units used in the application of electricity, which are subject to legal requirements, or, in the absence of same, to the agreements adopted by international assemblies which have met for this purpose; also the definition and specification of units relative to those magnitudes for which the above-mentioned precedents are lacking.

(3) Fixing and regulating the process or procedure by which the exactness of electric measurements may be assured within industrial and commercial limits, it being obligatory for all classes of functionaries intrusted with the technical inspection of industrial measuring apparatus to observe these regulations.

III. For the purpose of studying these questions and the formulation of the proper regulations, there shall be formed a national federation which shall embody the official laboratories already radicated in Spain.

Regulation Should Cover Municipal Systems

Failure to Include Them Allows Wasteful Competition—Their Inclusion Would Prevent Ruthless Cutting of Rates and Discrimination in Serving Public

BY EDWIN O. EDGERTON

STATE regulation of privately owned public utility service having become an accomplished fact and being now looked upon as permanent, discussion is becoming more vigorous and extended as to the wisdom of similar state regulation of municipally owned and operated public utility services. This question, of course, should be determined on its merits, free from all prejudice for or against public ownership, and inasmuch as there is now, except in a few instances, no state regulation of municipally owned and operated utility service in the United States, this comparatively new activity of regulation should not be entered upon unless there exist recognized evils to be corrected or clearly established benefits to result.

If we start with the premise that unnecessary economic waste is a loss to the whole community regardless by whom or against whom committed, it will appear at once by mere recitation of the facts that regulation or restraint must be had of the activities of municipalities recklessly entering into competition with privately owned and operated and regulated utilities.

MONOPOLY UNDER REGULATION SOUND POLICY

In the privately owned public utility field today it is universally conceded that with state regulation the creation of monopoly and the prevention of competition is sound policy in the interest of the people. It is not seriously contended by informed people that where a public utility is adequately serving at reasonable rates a competitor should be allowed to enter the field, parallel the existing system and cut rates, as experience has time and again demonstrated that this results in grave economic loss, inability to give service and injury to the public.

Precisely the same reasons are good as against a municipality entering a field already adequately served by a privately owned utility, paralleling its system, creating a duplicate investment, and by mercilessly cutting rates wholly or partially destroying its rivals. It must appeal to all reasoning people that, conceding the right of a municipality to go into the business of serving its citizens with a utility service, this right should either only be exercised by acquisition of an existing utility system or restraint should be laid upon the city to the extent of compelling it first to make an adequate offer to purchase the existing system, in the event of the refusal of this offer permission to be accorded to the city to compete.

In a situation where competition already exists between a municipally owned plant and one privately owned and operated regulation of the publicly owned plant should be had precisely for the same reasons as prevail in regard to the privately owned plant.

Rates should be controlled, so that the power to cut rates could not be used to annihilate a rival and destroy investment. Neither should a municipality be left wholly unrestrained in the matter of discrimination in giving service in a competitive field. The city should give service as freely and as fairly as the privately owned company and without discrimination or favoritism.

To accomplish these ends continuous regulation is necessary—that is to say, there must be an effective body of trained men thoroughly familiar with the principles and practices involved in utility service at all times available to make decisions, and such body exists in every state in the Union in the public utility commissions. It is only necessary by law to empower these commissions to regulate the municipally owned utility services.

MUNICIPAL ZEALOTS' ARGUMENTS

I realize that this reasoning is vigorously, if not violently, objected to by the zealous municipal ownership advocate. He argues that the right of the city to serve its citizens with a utility service is and should be unrestrained and not regulated, and that it is neither immoral nor illegal ruthlessly to sacrifice the investment made in a privately owned public utility which is adequately serving the citizens and to parallel and compete, even to the extent of cutting rates below the cost of operation—the deficit to be made up out of taxation.

Some of these zealots concede that economic loss results in unrestrained competition, but they justify the imposition of this loss upon the people by arguing that ultimately public ownership is a vastly beneficial institution fully compensating for the economic loss whch occurs in the destruction of a private rival.

I never have been able to agree either as to the morals or the economics of such proposals. Considered from the moral side, it must be remembered that the public invited the privately owned company to institute and install its service. Frequently this invitation was vigorously extended even to the point of urging, but in most instances the invitation is evidenced by the granting of a franchise by municipalities, which alone and of itself is an indication of a desire that private capital undertake the job of serving the public.

While it must be admitted that there is no governmental guarantee of protection against municipal competition, nevertheless there is an implied agreement that private capital thus invited into a city will be fairly dealt with. Certainly it is true that if at the time of the investment of the money in the privately owned public utility the city had announced that any one investing in such an enterprise must do so with the clear understanding that it was the purpose of the city to exercise its legal privilege of completely paralleling and competing with the proposed system, not one dollar of investment would have been made.

UNSELFISHNESS CHARACTERIZES PRIVATE PLANT AS MUCH AS MUNICIPAL

It seems to be assumed by those who argue against state regulation of publicly owned utilities that there is some peculiar and unselfish status of publicly owned enterprises which distinguishes them in every respect from those privately owned, even though those privately owned are devoted entirely to public service. It must be pointed out, however, that your public ownership zealot appeals to the people on wholly selfish grounds in an attempt to get support for his municipal project. In effect he says, "Let me build for you a municipal utility system, vote the necessary bonds, tax yourselves for this purpose, and I, acting on your behalf, will wreck and ruin the existing utility for your benefit in order that you may have cheap rates." Of course he

does not say this in terms, but analyze his appeals to the people and these precise suggestions will be found, if only by inference.

What sound objection can be raised to state regulation of municipally owned utilities? If these enterprises are sound, if they are being properly conducted, if they are in every respect successful, then those who are interested in them should welcome the opportunity for complete public exposition before a state commission trained to analyze utility operations and capable of laying down sound rules in the interests of the people. Would it not be a great satisfaction to the people of a city to know that at all times there was a wholly impartial trained body of experts under the guidance of experienced commissioners constantly available to consider complaints and with constant supervision of the activities of those engaged in operating a municipal enterprise?

Longer Spans Proposed for Rural Lines

By Selecting Conductors with High Elastic Limit and Properly Guying Poles at Sharp Corners and Dead-Ends Urban Factors of Safety Can Be Obtained with Poles Placed 250 Ft. Apart

IN CONSIDERING the type of line construction best adapted for electric service in rural districts it is evident that some type of construction less expensive than that standardized for urban work is necessary to make farm lines an economic possibility. On the other hand, it is essential that there be no sacrifice of a reasonable factor of safety, that the construction involve a minimum amount of maintenance since it is relatively difficult to reach, and that easily obtainable materials be used.

There are two generally used methods of running distribution circuits to supply rural districts. Such circuits may be run from outdoor substations connected to transmission lines or may be simply extensions of urban distribution circuits. The method adopted will depend on the character and extent of the territory to be served. The standard voltages for such circuits include 2,300 volts, single-phase or three-phase, 2,300/4,000 volts, three-phase, four-wire, and 6,600 volts and 11,000 volts, single-phase or three-phase. It is advantageous for a company to use the same voltage for rural lines as for urban distribution circuits where this arrangement is practicable, because transformers, insulators and other accessories are then interchangeable. If it is necessary to use a higher voltage, the choice will depend upon an analysis of the individual case, in which the load, distance and cost of wire, insulators, transformers, fuses and lightning arresters must all be considered.

The use of 125-ft. (37-m.) spans has been inherited by the electric companies from the telephone companies, whose large number of wires made this practice necessary. In general the maximum span length is fixed by the transverse strength of the poles, or, with a given height of pole, by the clearance to ground obtained at the center of the span with the conductor used. On rural lines it will generally be found necessary to string only two or three primary wires of comparatively small size. It is therefore possible, so far as the poles are concerned, to increase the span length very materially, at the same time keeping the same factor of safety usual in urban construction. One of the accompanying sets of curves shows the relation between transverse strength of new and old poles and the safe number of wires for 250-ft. (75-m.) spans.

It is believed that this span length offers a number of advantages. It may be used for primary line extensions with Class B or Class C poles without sacrifice of the required factor of safety. Using 30-ft. (9-m.) poles and suitable conductors, the necessary clearance to ground can be obtained with this span, and finally, if increased business makes additional wires necessary, such a line can be changed to 125-ft. spans by setting the intervening poles. With such construction it is desirable to shorten spans and double-arm poles at sharp corners and dead-ends and to guy the poles thoroughly at such positions.

With the long-span construction outlined above it is necessary to use a conductor having a higher elastic limit than the No. 6 soft drawn copper in common use for light lines. There are four materials which have the necessary strength—steel wire, copper-clad steel wire, hard-drawn copper wire and steel-cored aluminum cable. Except in cases where the line current is very small and the distance short, the first material is unsatisfactory because of its low conductivity. For general service on long-span rural lines the choice appears to rest between hard-drawn copper wire and steel-cored aluminum cable, since there is usually no important price differential between those materials when purchasing wire of equal conductivity. Steel-cored aluminum requires somewhat more care than copper in instal-

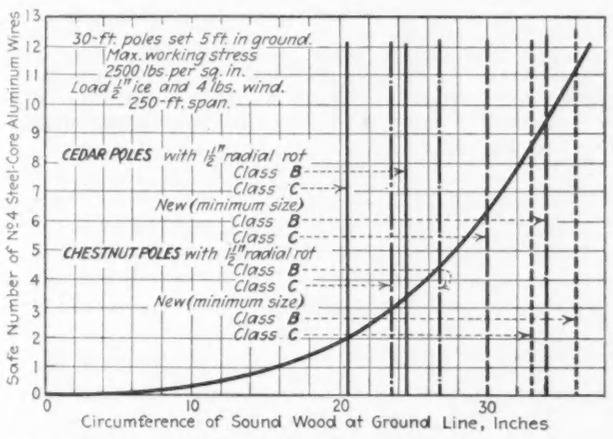
COMPARATIVE COST OF 125-FT. AND 250-FT. SPANS FOR 1 MILE OF 2,300-VOLT, SINGLE-PHASE LINE

Item	Quantity		Cost	
Material:	125-Ft.	250-Ft.	125-Ft.	250-Ft.
Western cedar poles, 30-ft., butt-treated	43 (6-in. top)	23 Class C	$447.20	$276.00
Four-pin fir cross arms with pins and braces	45	27	45.00	27.00
Galvanized machine bolts:				
⅝ in.x10 in.	41	19	4.92	2.38
⅝ in.x14 in.	2	4	.31	.62
Double-arm bolts, ⅝ in. x 14 in.	4	8	.65	1.30
Lag bolts, ½ in.x4 in.	45	27	1.35	.81
Guy anchors, 6-ft.	2	2	7.12	7.12
Galvanized steel cable, ¼-in.	100 ft.	400 ft.	1.00	4.00
Guy clamps, three-bolt	4	8	.96	1.92
Strain insulators	2	6	.82	2.46
Porcelain insulators	90	54	40.50	24.30
Conductor (T. B. W. P.)	11,000 ft. No. 6 copper	10,800 ft. No. 4 aluminum and 200-ft. tie wire	221.00	212.00
Miscellaneous	.....	.....	10.00	10.00
Labor and Cartage:				
Drawing poles	.....	.....	48.00	32.00
Setting	.....	.....	230.00	128.00
Cartage	.....	.....	62.00	40.00
Placing	.....	.....	22.50	11.50
Guying	.....	.....	12.00	15.00
Stringing wire	.....	.....	110.00	115.50
Supervision	.....	.....	48.45	34.20
Total labor and material	.....	.....	$1,313.78	$946.11
Overhead, at 15 per cent	.....	.....	197.07	141.92
Total cost	.....	.....	$1,510.85	$1,088.03

lation, and the junk value of copper is a much higher percentage of its first cost than is the case with steel-cored aluminum. Steel-cored aluminum is, however, much stronger than hard-drawn copper of the same conductivity and is, therefore, better adapted in small sizes for stringing long spans on low supports. Two curve sheets are appended showing the recommended sags for No. 6 hard-drawn copper wire and No. 4 steel-reinforced aluminum cable.

Standard N. E. L. A. cross-arms with standard 1½-in. (3.75-cm.) locust pins are suitable for the construction proposed. The use of cross-arms long enough to give 30-in. (75-cm.) conductor separation is suggested, and standard *galvanized* line hardware should be used.

The saving to be effected by the proposed construction will vary with different companies, being dependent principally on the material used for poles and on the cost of labor. For comparison data are given showing the cost of one mile of single-phase, 2,300-volt line of



TRANSVERSE STRENGTH OF LINE COMPOSED OF WESTERN RED CEDAR AND CHESTNUT POLES

standard construction and one mile of long-span construction on reasonably straight road, free from trees and where no conflicts would be encountered with the construction of other utility companies. It is assumed that both lines are dead-ended at each end of the mile. In localities where chestnut poles can be easily obtained it will be possible to reduce the first cost of the line materially by their use.

The foregoing information was prepared by the subcommittee of the Empire State Gas and Electric Association on construction standards for farm lines, consisting of Sydney Alling, chairman; G. W. Ide and E. P. Peck. It is one part of the work of the general committee on rural service, headed by Bert H. Shepard, which is now giving particular attention to the rate situation. The same committee has prepared specifications for the construction of long-span farm lines on wood poles. Parts of the specifications follow:

General Arrangement of Line Supports.—The maximum span length shall be 250 ft., and spans of this length shall be used throughout except as specified below. Spans may be shortened to clear obstructions such as roads, driveways, streams, lawns, etc., and shall be shortened at dead ends and angles of over 45 deg. Spans adjacent to a dead-end pole or pole carrying a corner of over 45 deg. shall not be more than 125 ft. long. Poles adjoining dead end poles or adjoining poles carrying sharp corners shall be double-armed.

Poles.—Poles shall be Western cedar, Northern cedar or chestnut and shall conform to N. E. L. A. specifications for the kind of pole used. Poles shall have the following minimum dimensions for the various kinds and classes specified:

WESTERN CEDAR

Length of Poles (Ft.)	Class A (Minimum Top Circumference 28 In.) Circumference 6 Ft. from Butt	Class B (Minimum Top Circumference 25 In.) Circumference 6 Ft. from Butt	Class C (Minimum Top Circumference 22 In.) Circumference 6 Ft. from Butt
30	37	34	30
35	40	36	32
40	43	38	34
45	45	40	36
50	47	42	38
55	49	44	40
60	52	46	41
65	54	48	43

NORTHERN CEDAR

Length of Poles, Ft.	Class A		Class B		Class C	
	Top	6 In. from Butt	Top	6 In. from Butt	Top	6 In. from Butt
30	24	40	22	36	18½	33
35	24	43	22	38	18½	36
40	24	47	22	43	18½	40
45	24	50	22	47	18½	43
50	24	53	22	50	18½	46
55	24	56	22	53	18½	49
60	24	59	22	56	...	..

CHESTNUT

Length of Poles, Ft.	Class A		Class B		Class C	
	Top	6 In. from Butt	Top	6 In. from Butt	Top	6 In. from Butt
30	24	40	22	36	20	33
35	24	43	22	40	20	36
40	24	45	22	43	20	40
45	24	48	22	47	20	43
50	24	51	22	50	20	46
55	22	54	22	53	20	49
60	22	57	22	56	..	..
65	22	60	22	59	..	..
70	22	63	22	62	..	..
75	22	66	22	65	..	..
80	22	70	22	69	..	..
85	22	73	22	72	..	..
90	22	76	22	75	..	..

Poles shall be Class C for two-wire or three-wire lines and Class B for four-wire or five-wire lines. Where more than five wires are run Class A poles may be used, but it is recommended that the use of spans shorter than specified above be considered for such lines.

Poles shall be set in accordance with the following table:

Length of Pole, Ft.	Depth of Setting, Ft. and In.		Length of Pole, Ft.	Depth of Setting, Ft. and In.	
30	5	0	50	6	6
35	5	6	55	7	0
40	6	0	60	7	6
45	6	0			

. . . In backfilling holes, two tampers shall work with one shoveler, the earth being thoroughly tamped in place. All water shall be removed from pole holes before poles are set. The ground shall be graded up around the base of the pole to provide for settlement, the premises being left in as good condition as found. It is recommended that the use of poles treated with preservative by the open-tank process be considered.

Cross-Arms and Accessories.—Cross-arms shall be made of close-grained Douglas fir having not less than twelve annular rings per inch width of cross-section. Two-pin cross-arms shall be 3½ in. x 4½ in. x 3 ft. 2 in. with 2-ft. 6-in. pin spacing. Four-pin cross-arms shall be 3½ in. x 4½ in. x 5 ft. 7 in. long with pins arranged for 2 ft. 6 in. climbing space and 14½-in. pin spacing. Six-pin cross-arms shall be 3½ in. x 4½ in. x 8 ft. long with pins arranged as specified for four-pin arms. . . . Cross-arms shall not be treated or painted. . . . Double arms shall be joined by two ⅝-in. double-arming bolts installed 11 in. from the outer ends of the arms on four-pin and six-pin arms and 6-in. from the outer ends of two-pin arms. Extension arms shall be provided with an extension arm brace made of 1¾-in. x 1¾-in. x ⅛-in. steel angle, 7 ft. long, and having a suitable step, in addition to the standard braces. Two extension arm braces shall be used on double extension arms. . . .

Guys and Anchors.—All angles in the line of over 1 deg. shall be securely guyed. In the following table it is assumed that the guys specified make an angle of not less than 30

deg. with the center line of the pole. Where the angle is less than this proper allowance must be made in selecting the guy and anchor to be used:

TWO-WIRE LINE

Angle in Line, Deg.	Number and Size of Guy Cables	Size and Length of Anchor Rod	Size of Diameter	Dead-Man Length
10	One, $\frac{3}{8}$ in.	$\frac{3}{4}$x5 ft.	12 in.	1 ft. 6 in.
30	One, $\frac{7}{16}$ in.	$\frac{3}{4}$x6 ft.	12 in.	2 ft. 6 in.
45	One, $\frac{1}{2}$ in.	$\frac{3}{4}$x6 ft.	12 in.	3 ft. 0 in.
60 Dead-end	One, $\frac{1}{2}$ in.	$\frac{3}{4}$x7 ft.	12 in.	3 ft. 0 in.

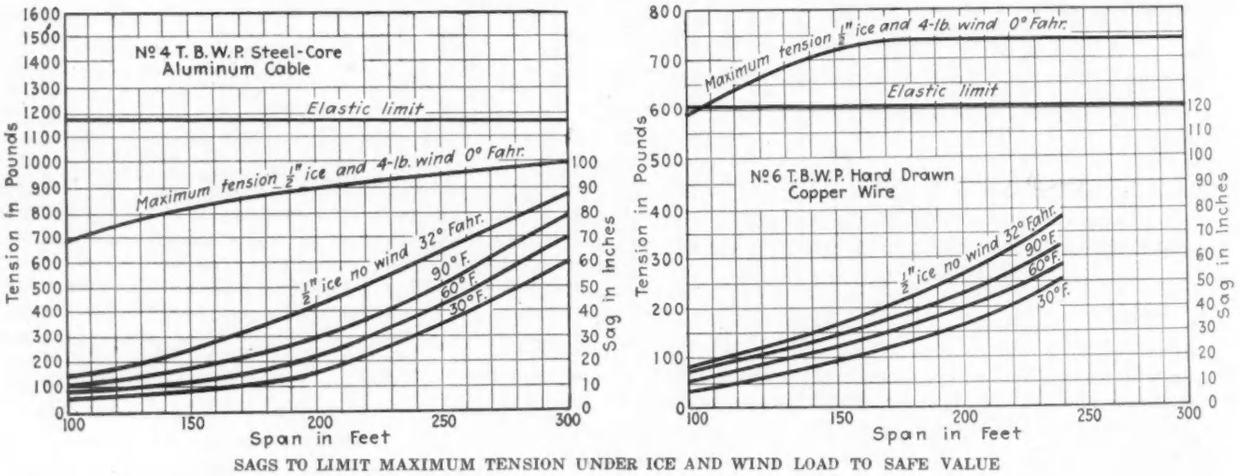
FIVE-WIRE LINE

Angle in Line, Deg.	Number and Size of Guy Cables	Number, Size and Length of Anchor Rod	Number and Size Dead-Men Diameter	Length
10	One, $\frac{1}{2}$ in.	One, $\frac{3}{4}$x6 ft.	One, 12 in.	2 ft. 0 in.
30	One, $\frac{7}{16}$ in.	One, $\frac{3}{4}$x7 ft.	One, 12 in.	4 ft. 0 in.
45	Two, $\frac{7}{16}$ in.	One, $\frac{3}{4}$x8 ft.	One, 12 in.	4 ft. 0 in.
60 Dead-end	Two, $\frac{1}{2}$ in.	Two, $\frac{3}{4}$x7 ft.	Two, 12 in.	4 ft. 0 in.

All guy cable shall be double-galvanized Siemens-Martin steel strand. Anchors shall be set at such a depth that the entire length of the anchor rod specified except the eye is buried, the rod being nearly vertical but inclined slightly so that the anchor bears against undisturbed earth. All-metal anchors may be used instead of the dead-men specified provided that an anchorage is secured which will develop the full strength of the guy cable specified. All anchor rods shall be double hot-galvanized and shall be secured to dead-men by a 3-in. x 3-in. x $\frac{3}{8}$-in. washer and nut. Guys shall be attached to poles close to cross-arms by taking one and one-half turns around the pole and fastening with a three-bolt clamp. Suitable strain insulators shall be used in all guys and shall be placed not less than 9 ft. from the ground and not less than 6 ft. from the pole. Guys from pole to pole shall be provided with a strain insulator at each end not less than 6 ft. from the pole. Guys small be attached to strain insulators and anchor rods by a three-bolt clamp and a made-up joint. Suitable galvanized thimbles shall be used in attaching guys to anchor rods. Suitable guy hooks or lag bolts shall be used to secure guys in place on poles. . . .

Wire.—Where aluminum cable, steel-reinforced, is used for line conductors, the following specification applies: Wire shall be covered with triple-braid weatherproof insulation. No. 6 D. B. W. P. aluminum wire shall be used for tie wire. Line conductors shall be tied in the top groove of insulators on straight runs with an unprotected bridle tie, the wire being snug around the line conductor five turns on each side of the insulator. On corners wires shall be tied in the side groove of insulators with an unprotected bridle tie as described above so that the strain is carried by the insulator and not by the tie wire. On insulators without top groove wires shall be tied in the side groove on the pole side of the insulator with an unprotected bridle tie as described above. All splices in line conductors shall be made with suitable two-piece aluminum sleeves. The ends to be spliced shall be properly stripped, cleaned and inserted in the sleeves the full length plus 1 in. and each sleeve twisted, with suitable wrenches, four complete turns, the two sleeves being twisted in opposite directions. Where possible sleeves shall be twisted in a direction to tighten strands of cable. Joints shall be covered with not less than four layers of friction tape. Great care shall be taken not to kink or nick line wires and any wire so damaged shall be cut out and a splice made. The accompanying curves show the sags and tensions for No. 4 A. C. S. R. with T. B. W. P. insulation. All joints between copper conductors and aluminum conductors shall be made with suitable aluminum clamps provided with a copper bushing. Clamp joints shall be covered with four layers of friction tape after installation. In making joints with clamps both copper and aluminum conductors shall be carefully cleaned so as to remove all foreign matter from the metal before the clamp is installed.

Where medium or hard-drawn copper wire is used for line conductors the following specification applies. Wire shall be covered with triple-braid weatherproof insulation. No. 6 D. B. W. P. soft-drawn copper wire shall be used for tie wire. Ties shall be made as specified for A. C. S. R. All splices in line conductors shall be made with suitable one-piece copper sleeves. The ends to be spliced shall be properly stripped, cleaned and inserted in the sleeves the full length plus 1 in. and the sleeve twisted with suitable wrenches four complete turns. Joints shall be covered with not less than four layers of friction tape. Tape shall be made with sleeves as above specified or with properly wrapped joints over which solder shall be poured. Medium or hard-drawn copper conductors shall not be soldered with a blow torch. The accompanying curve sheet shows the sags and tensions for No. 6 T. B. W. P. hard-drawn copper conductors.


No 4 T. B. W. P. Steel-Core Aluminum Cable
Elastic limit
Maximum tension ½" ice and 4-lb. wind 0° Fahr.
½" ice no wind 32° Fahr.
90° F.
60° F.
30° F.
Tension in Pounds
Sag in Inches
Span in Feet
No 6 T. B. W. P. Hard Drawn Copper Wire

SAGS TO LIMIT MAXIMUM TENSION UNDER ICE AND WIND LOAD TO SAFE VALUE

Hydro-Electricity in Czechoslovakia

THERE are, according to an official report of an agent of the British government, as quoted in the London *Electrician*, few countries in which electric supply has reached such an advanced stage of development as in Czechoslovakia. In 1919 there were 390 power stations, including six of more than 10,000 kw. rating, three of from 5,000 kw. to 10,000 kw. and twenty-eight of from 1,000 kw. to 5,000 kw. The Prague central station has a normal output of 22,500 kw. There are several hydro-electric installations in operation, and many more are contemplated. In Bohemia it is estimated that the maximum output of hydro-electric power (mainly on the Elbe and Moldau) is equal to 355,000 kw., in Slovakia to 200,000 kw. and in Moravia to 59,000 kw., or a total of more than 600,000 kw. for the entire republic. The standard trunk-line voltage as development proceeds will be 100,000, with permission to employ 50,000 volts temporarily.

To Protect Junior Securities*

Suggestion Made to Investment Bankers' Association of America for Amortization of Discounts on Utility Securities

By Cyrus Pierce

THE financing of public utilities through the medium of junior securities is becoming of more and more importance all the time, but before it can be done in any large way there are two vital points that must be safeguarded. First, the income of the company must be sufficient and so stabilized that the dividends on these junior securities will be paid with the same punctuality as the interest on the funded debt; and, second, the security upon which the issues are based must be ample to safeguard the principal. In order to accomplish these two things it seems to me to be necessary for the Investment Bankers' Association to use the weight of its influence with the various public utility commissions to the end that the rates may be adequate not only to pay the dividends but to maintain the physical property.

It has been current practice recently when public utility bonds are issued to limit the issue at par and the face amount of the issue to 75 per cent of the cost of the improvements to be made. Therefore, the other 25 per cent, and in addition thereto such discount from the sale of the bonds as the company is compelled to stand in order to market them, must be made up. Somewhere, somehow, the utilities have been called upon to find this money. It is now the fashion to provide this from the sale of stock. In most cases it is preferred stock. It is customary to say to an intending investor that every dollar he puts into the preferred stock is represented by a dollar of fixed assets, and this is true in most instances. It also is true that recently most utilities had to sell their preferred stocks on an 8 per cent basis, which, if the stock is a 6 per cent stock, means the sale of it at about 75. Ordinarily 8 per cent is all a company is permitted by the commissions to earn on the investment. Therefore there is no profit to the company. The earnings do not provide a means by which these discounts may be quickly amortized or a surplus built up to protect the investor, the further result being that there is little chance of there being an increase in the intrinsic value of the securities of the corporation which are junior to the preferred stock and which should be the vehicle for providing additional equity. And, as their market can't improve, their price cannot go up, and consequently the price at which the company must continue to sell its preferred stock remains low. Discounts continue excessive and the vicious circle goes on.

Reserve for Lean Years

This attitude on the part of regulating bodies too closely restricting earnings cannot help but eventually result in two things—first, that the sale of junior securities will become increasingly difficult at relatively higher costs of money, and finally that it will become impossible to raise money from that source at all because the company cannot afford to pay the price which investors will demand where there is regulation of security but no assurance that the issuing corporation will have such earnings as will enable it to administer its financial affairs along those lines which experience has shown to be necessary. Those lines are that there should be sufficient earnings to enable the corporation to lay up in good years a reserve which may be applied to dividends as an assurance against the time, which always recurs in every corporation's experience, when earnings will not be sufficient to pay such dividends. This reserve, of course, also constitutes an assurance of the continuity of the promised dividends upon the preferred stock; and, over and above this, there should be earnings sufficiently beyond this to make it possible for the company within a comparatively short space of time to build up in actual property against which no securities can be issued an equity equal in par value to the amount of discount upon its outstanding securities.

If a company were static, this would be easy, but in a growing company where the annual construction requirements run into the millions this has become a grave problem and the cord is being drawn tighter each year around the neck of the unfortunate corporation.

Credit Is Not Capital

This matter of discount upon securities is a very vital one and one which I believe has not had the attention it deserves. Your public utility commission says that this receives due weight in computing the cost of money ascertained through a table which is scientifically accurate, and where the company is permitted to sell its definite maturity bonds upon a definite basis this amortization has been foreseen and provided for. This reasoning, however, overlooks a very important consideration. Assuming that a company spends $10,000,000 cash in one year for a new development and issues against it $7,500,000 of bonds and $2,500,000 of preferred stock which are sold at 90, the company is in the position of having an installed property which costs $10,000,000 but against which it has received but $9,000,000. One million dollars must be provided from some source, and that $1,000,000 is immediately reflected in floating debt. This may temporarily be carried as open accounts and then as notes in favor of the vender, and finally, when the vender must be paid, these notes or their successors find their way into the hands of the banks with which the company does business, with the result that the company has made permanent capital expenditures of $1,000,000 and obtained the money therefor by using bank credit. This is a highly improper proceeding as credit must never be confused with capital.

What is the remedy?

Let us refer back for a moment to the example of the company that spent $10,000,000 and received $9,000,000 from the sale of its bonds and preferred stock. This $1,000,000 of deficiency which must be provided should be made up by the sale of common stock. It is apparent, however, that after the common stock is sold there is no property value behind it. It, therefore, must either bear such a dividend as to make it a good speculation or it must be safeguarded, and the only way that it can be safeguarded is to build up the property value behind it. Let us assume that the $1,000,000 is provided by the sale of common stock at 75. This would mean that there must be sold common stock to the par value of $1,333,-333, against which, as stated before, there is no property value. Under present conditions this stock is not salable, but the public service commissions must be brought to a point of view where they will regard the discount of $1,333,333 as a construction charge to be added to the property value—a view that is more or less fallacious—or they must allow the company to make sufficient earnings not only to pay the interest on the

*A paper read before the recent convention at New Orleans.

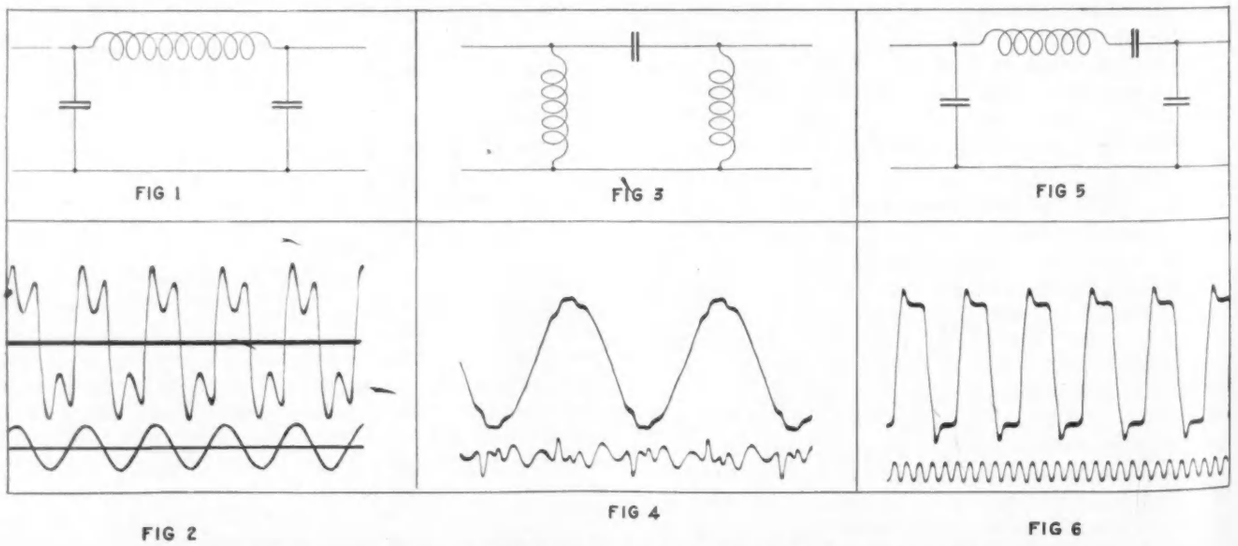
bonds and the dividends on the $2,500,000 preferred and $1,333,333 common stock, but earnings sufficient also to provide proper depreciation, and over and above all this to build up within a reasonable time, say five years, a property value of $1,333,000. In other words, they must allow the company to earn, in addition to the above items, $266,666 each year in additional property against which no securities, either bonds or stock, may be issued. And when something of this kind is done, and only then, can a reasonable amount of the financing of our public utility companies be properly accomplished through the sale of junior securities.

Isolating Single Frequency from Irregular Waves

Combinations of Inductance and Capacitance for Filtering Harmonics—Useful in Bridge Work and Wave Study as Well as in Communication

ELECTRIC filtering arrangements for different purposes are coming into increasing prominence as the need for purity of wave form is more felt in alternating-current bridge work, etc. The recent applications of selective circuits in the new carrier-wave multiplex telephony have directed attention to the usefulness of electric filters also for commercial purposes. It has been known for a long time that combinations of inductance coils and condensers in periodically recurring sections are remarkable for their high selectivity with respect to frequency. The design and application of filters was studied by Shepherd (*London Electrician*) and has recently been taken up at some length by G. W. Pierce ("Electric Oscillations," McGraw-Hill Book Company). We produce here a few illustrative oscillograms, selected from a most remarkable and interesting collection, published in an article by K. W. Wagner (*Archiv für Elektrotechnik*), where the general theory of filters is studied and curves of the damping and retardation factors are given for various old and new types of filters. The most commonly applied form of electric filter is that shown in Fig. 1. In this form the filter section is identical with an ordinary artificial transmission-line section. Up to a certain frequency such a section offers very little damping if the resistance is small, although the phase lag of received voltage may be considerable. Currents of frequencies above the so-called "cut-off point," however, will suffer an exceedingly large attenuation, so that a filter of only very few sections is often sufficient to nearly cut out all overtones in a distorted wave, provided, of course, that the cut-off point is above the fundamental frequency, but below that of the first overtone.

Fig. 2 gives a very clear demonstration of this filtering action. The upper curve represents the impressed voltage, which has a fundamental of 250 cycles but shows pronounced overtones. The lower curve is the ϕ voltage at the fifth section of a filter according to Fig. 1, with $L = 190$ mh., $R = 10$ ohms, $C = 2$ mf., having a cut-off point of $f_0 = 512$ cycles. The distance ϕ represents the phase lag of voltage. Just the opposite characteristic has a filter of the series-condenser type shown in Fig. 3. Such a section will let through all frequencies above a certain limit, but will greatly attenuate all lower frequencies. The filter therefore may be used to sift out all the overtones from a given wave, as Fig. 4 shows. The same reactors as before were used, when this oscillogram was taken, and the filter had 5 sections, but the capacity was $C = 1$ mf. and the frequency cut-off point was at 182 cycles. During the experiment the fundamental frequency was 100 cycles, and since the filter completely suppressed the fundamental, the lower curve may be used for a schedule analysis leading to accurate values of all the higher harmonics. It is even possible, by combining sections of the two described types to construct a filter which will pick out one particular overtone from an impure wave. The same results can be reached by giving each section a double frequency response, as in Fig. 5. This is shown very admirably in Fig. 6, an oscillogram obtained with three sections, using reactors with $L = 195$ mh. and with $C = 1.36$ mf. and $K = 0.085$ mf. The received voltage contains practically nothing but the fifth harmonic of the impure 250-cycle wave impressed at the input end of the filter. It is filters of this latter type that find application in multiplex telephony, for separating the simultaneously transmitted carrier waves, each representing a band spectrum of frequencies and each carrying the voice of one of the ten or more persons talking simultaneously over the same wires.



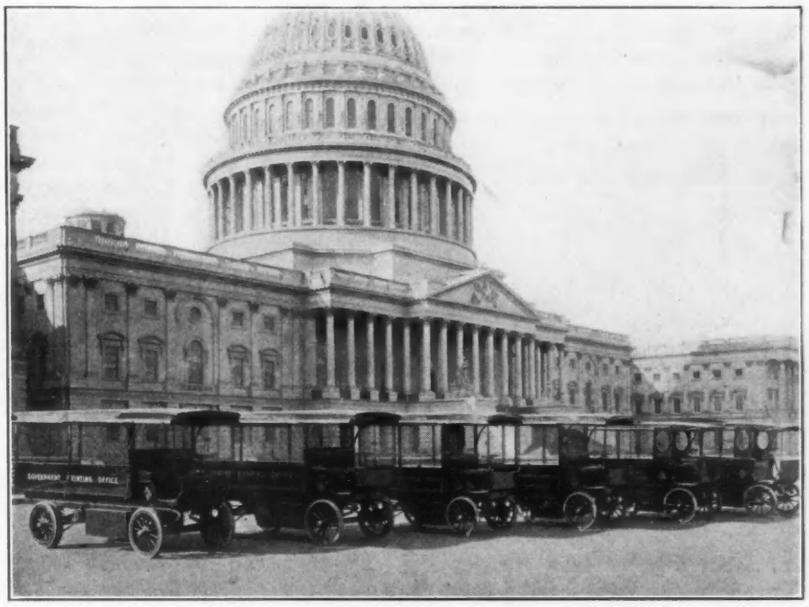
CIRCUIT ARRANGEMENTS FOR FILTERING AND THEIR EFFECTIVENESS AS SHOWN BY OSCILLOGRAMS

Electric Vehicle Operation Cheaper than Gasoline Truck

Operating Costs of Electric Trucks in Government Service in Washington, D. C., Compared with the Cost of Gasoline Trucks Under Similar Conditions—Electric Trucks Superior for City Requirements

By WALTER R. METZ
Superintendent of Buildings, Government Printing Office, Washington, D. C.

AFTER nine years' experience in the maintenance of electric vehicles and keeping the most reliable cost figures obtainable in connection therewith, I am convinced that the electric truck has a distinct place in commercial life and in this place is far cheaper to operate than either horse-drawn or gasoline-driven trucks. As a general proposition, it appears that the electrically driven machine is better for city service where the streets are in fairly good condition, and that the gasoline-driven machine is better for long hauls over rough roads and in the open country, mainly on account of the ability to obtain gasoline and water and the chances of making greater speed.



ELECTRIC TRUCKS IN GOVERNMENT PRINTING OFFICE SERVICE ARE SHOWING GREATER ECONOMY THAN GASOLINE TYPE

During the period mentioned the department under my supervision has operated eight electric trucks and for the last three years two additional ones. All these trucks are still in operation, making their regular trips without unusual interruption of the service. Table I shows the average cost of upkeep of the variously sized machines based on data kept for the last nine years. Since the operating cost of machines of similar size is aproximately the same data are given for each size only. In these tables the cost of energy is the actual cost of production at our own plant and varies from about 1¼ cents to 2 cents per kilowatt-hour. The battery upkeep and tire upkeep cover actual repairs and renewals. Electric repairs cover repairs to motors, lamps, wiring, etc. Mechanical repairs cover all repairs to the machine proper, including the body repairs and painting. Inspection and cleaning cover all miscellaneous garage work, which is equally divided among all cars in service.

In this particular department the cost of upkeep of the buildings, including heat and light, was 35 cents per

TABLE I—AVERAGE OPERATING EXPENSE* OF FIVE SIZES OF ELECTRIC TRUCKS IN GOVERNMENT SERVICE BASED ON NINE YEARS' DATA

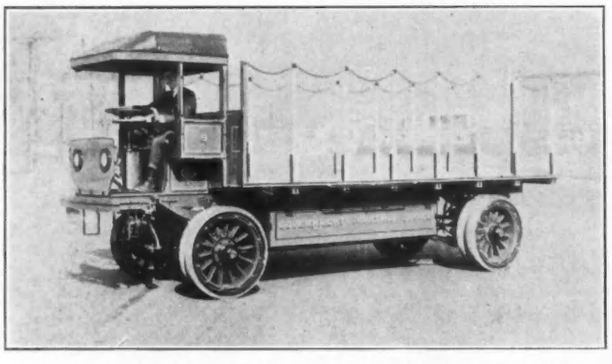
Size of truck	1,000 Lb.		2,000 Lb.		5,000 Lb.		8,000 Lb.		10,000 Lb.†	
Total mileage	54,600 miles		54,051 miles		40,181 miles		30,419 miles		9,595 miles	
Size of tires	F. 34x3, R. 34x3		F. 34x3½, R. 34x3½		F. 36x4, R. 36x4 Dual		F. 36x6, R. 36x4 Dual		36x4, 5 or 6, or 36x10 Dual	
	Per Year	Per Mile	Per Year	Per Mile	Per Year	Per Mile	Per Year	Per Mile	Per Year	Per Mile
Energy	$36.88	$0.0061	$45.43	$0.0070	$58.04	$0.0130	$58.40	$0.0150	$77.14	$0.0240
Battery upkeep	154.22	.0250	170.21	.0280	157.77	.0350	210.46	.0550	.....	.....
Tire upkeep	35.35	.0058	63.21	.0105	78.98	.0177	73.54	.0193	89.44	.0277
Electric repairs (exclusive of battery)	32.30	.0051	51.69	.0086	31.90	.0071	27.21	.0071	54.94	.0170
Mechanical repairs	108.82	.0179	108.22	.0180	111.90	.0250	84.86	.0223	29.53	.0090
Inspection and cleaning	324.69	.0535	318.66	.0530	314.91	.0705	339.42	.0893	325.83	.1020
Total operating expense	$692.26	$0.1134	$757.42	$0.1251	$753.50	$0.1683	$793.89	$0.2080	$576.88	$0.1797
Interest on investment	69.60	.....	$82.50	.....	$106.26	.....	$165.27	.....	$171.30	.....
Depreciation	232.00	.....	275.00	.....	354.20	.....	550.90	.....	571.00	.....
Garage	70.00	.....	70.00	.....	70.00	.....	70.00	.....	70.00	.....
Total expense	$1,063.86	$0.1753	$1,184.92	$0.1971	$1,283.96	$0.287	$1,580.06	$0.412	$1,389.18	$0.434

*Two types of vehicles are used, namely, Baker and Commercial. The former are rated at 1,000 lb., 2,000 lb., 5,000 lb. and 8,600 lb. capacity, while the Commercials are rated at 10,000 lb. All of the vehicles are equipped with Iron-clad Exide batteries. Wages for driver are not included; interest is figured at 6 per cent on half the investment; depreciation at 10 per cent.

† The extremely low operating cost of the 10,000 lb. car is partly due to the fact that it is only three years old and no battery renewals have been required to date.

square foot for the past year. Allowing 200 sq.ft. per truck, the garage rental space may, therefore, be taken as $70 per year. Depreciation can be figured at most at 10 per cent as the trucks have already been running ten years, and interest on investment may be taken as 6 per cent on one-half the original cost, as is usual. Adding these items to the average operating cost of each truck since its installation gives the total average cost for each size of truck shown at the bottom of Table I.

It is interesting to compare these costs with costs as published by other departments of the government. The report of the chief clerk of the Department of the Interior gives an analysis of cost of gasoline-driven trucks in the government fuel yard service for the period of Oct. 1, 1919, to June 30, 1920. These costs are shown in Table II. The operating expense has been calculated on the basis of the number of days the trucks were used, since it covered only the cost of supplies



ONE TRUCK WHICH HAS BEEN IN SERVICE THREE YEARS WITHOUT ANY BATTERY UPKEEP EXPENSE

and labor and material for repairs. The overhead is figured on the basis of the total days the trucks were on hand. The total is a combination of the two just mentioned. The cost of the 1-ton and 2-ton trucks is very low, probably because they have been used very little and because the mileage per day is very low.

The cost record of gas-driven trucks in the Post Office Department is given in the annual report of the Postmaster-General for the fiscal year 1920. Detailed figures are not given, but it is stated that depreciation and interest rate per annum is based on sixteen hours per day and 365 days per year. This rate varies from 20 per cent on from 2-ton to 3-ton equipment to 33 per cent on 1,000-lb. and 1,500-lb. equipment. The average cost for each size in the table mentioned is given in Table III. These costs evidently include garage repair charges and all operating expense. If the item of garage rental space is to be included, 22 cents should be added to the cost per day for each size truck.

Records of private firms are a little difficult to obtain but the cost data of one in the Middle West are available. The trucks haul concrete materials weighing about 100 lb. per cubic foot. The total mileage was about 50 miles per day, during one-half of which (the return trips) the trucks ran without load. Table IV shows the cost records. All costs are exclusive of drivers' wages.

A comparison of the costs of electric and gasoline-driven trucks (Table V) shows very conclusively that the electric is far cheaper to operate. It must be remembered that each type has a field of its own. The field of the electric truck probably lies largely in the cities, where high speeds cannot and should not prevail, where streets are well paved and where mileage is low.

There are numerous establishments throughout the country that apparently imagine that because a truck runs all day it must cover a lot of ground. Such is not the case. The average truck that operates eight hours per day is only actually running about 30 per cent of the time—and most run far less than this—the rest of the time being taken up in loading, unloading and waiting for one thing or another. Thirty per cent of eight hours is 2.4 hours, and at an average speed of 10 miles per hour a truck will cover only 24 miles per day. For light trucks this may be a little low, but for heavier trucks it is high, and it may be taken as a fair average.

It is estimated that there are 900,000 commercial gasoline-driven trucks in this country, and it is safe to say that from an economical standpoint a large portion of these trucks might well be replaced by electric trucks.

TABLE II—AVERAGE COST OF OPERATING GASOLINE TRUCKS EMPLOYED IN GOVERNMENT FUEL YARD SERVICE

Truck Capacity (Tons)	Operating Expense		Overhead		Total Exclusive of Drivers' Wage	
	Per Mile	Per Day	Per Mile	Per Day	Per Mile	Per Day
7½	$0.378	$16.07	$0.214	$5.32	$0.592	$21.39
5½	.336	14.04	.200	4.45	.536	18.49
2	.197	2.07	.163	3.08	.360	5.15
1	.275	2.23	.688	3.10	.963	5.33

NOTE.—Leave of absence with pay is charged to overhead, as are also rent, light, heat, supervisory officials and watchmen, and miscellaneous labor. Overhead is distributed over each type of truck on the basis of its capacity.

TABLE III—ANALYSIS OF GASOLINE TRUCK OPERATING COSTS* IN POST OFFICE SERVICE

Truck Capacity (Tons)	Operating Expense		
	Per Mile	Per Hour	Per Day
¼	$0.16	$0.70	$11.20
½	.275	1.015	16.24
¾	.21	.95	15.20
1	.20	.71	11.36
1½	.27	.86	13.76
2½	.15	.50	8.00
3	.42	.94	15.04
3½	.25	.70	11.20

* Includes repairs and all operating expenses, but exclusive of drivers' wages.

TABLE IV—EXPENSE* OF OPERATING GASOLINE TRUCKS USED IN HAULING CONCRETE CONSTITUENTS

Size Truck (Tons)	Operating Expense		Overhead		Total	
	Per Mile	Per Day	Per Mile	Per Day	Per Mile	Per Day
2	$0.104	$5.20	$0.052	$2.63	$0.156	$7.83
3	.130	6.50	.052	2.63	.182	9.13
5	.152	7.50	.074	3.70	.226	11.30

* The operating expenses include gasoline, lubricants, tires, repairs and maintenance. The overhead includes interest on investment, insurance, taxes and depreciation at 10 per cent. Drivers' wages are not included.

Transformer Development Is Recalled by Anniversary

IN THE article by W. S. Moody entitled "Transformer Development Is Recalled by Anniversary," appearing on page 1018 of the ELECTRICAL WORLD for Nov. 19, the comparative tabulation of old-type and new-type air-cooled transformers should read 97.90 per cent for half-load efficiency of the Niagara units (1896 design), instead of 98.90 per cent. The floor space dimensions for present practice noted in Fig. D and in the tabulation should be 27 in. x 53 in instead of 47 in. x 53 in.

Harriman Points Out Need for St. Lawrence Power

THE general plan and benefits of completely canalizing and electrically developing the St. Lawrence River was the subject of several intensely interesting addresses presented before a joint meeting of the four major engineering societies in New York not long ago. The large auditorium of the United Engineering Societies was filled to its capacity. Addresses were delivered by W. I. Harriman, president of the New England Power Company; Julius H. Barnes, representing Secretary of Commerce Hoover; Governor Allen of Kansas, ex-Governor Harding of Iowa and R. S. McElwee of Georgetown University.

Mr. Harriman expressed the belief that New York and Boston do not understand the basis of the St. Lawrence River project or they would not object to it. Despite the fact that the canalization of the St. Lawrence and the development of one power site (1,500,000 hp.) will cost about $250,000,000, the sale of energy from the one development at only 2 mills per kilowatt-hour would offset the total operating expenses, Mr. Harriman declared. Considered as a whole, the St. Lawrence development will afford about 4,500,000 hydro-electric horsepower, which is equivalent to 24,000,000 tons of coal burned for power generation in the most efficient stations.

If the St. Lawrence is developed, New York State will be entitled to one-quarter of the total output, New England to an equal amount and Canada to one-half. Mr. Harriman expressed the belief that Canada would be willing to let the United States have more than its share because the Dominion could not find a market for the output for some years to come. However, he pointed out that the entire power needs of the Middle Atlantic Superpower Zone in 1930 would not be much more than that which would be made available by development of the St. Lawrence.

Referring to the uses to which St. Lawrence power could be put in New England, he declared that there are 1,500 miles of railroad in that territory that could be electrified at a cost of $60,000,000 to $80,000,000. The annual charges on this investment would be offset to a great extent by the substitution of a thirteen-million-dollar power bill for the present thirty-million-dollar fuel bill. The saving in coal is only one economy that would be effected, however. In the course of ten years New England utilities would be able to absorb one and one-half to two billion kilowatt-hours. An equal amount could be absorbed by industries now generating their own power.

Governors Allen and Harding referred to an organization of eighteen states in the upper Mississippi valley, represented by their respective governors, that favor canalization of the St. Lawrence River and are intent on pushing it through. Both speakers made the claim that the saving in freight charges on grain alone which would be effected would pay for the St. Lawrence project in one year. Countries as distant as Argentina are now 12 to 18 cents per ton closer to New York in transportation charges than Iowa or Kansas. This makes it difficult for American farmers to dispose of their surplus production.

Mr. Barnes, who had charge of shipping food products abroad during the war, expressed the belief that the St. Lawrence project offers opportunities for large economies and great relief to agriculture.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Colorado River Development

To the Editors of the ELECTRICAL WORLD:

The Colorado River Commission was created by the League of the Southwest. The object of this commission is to collect the physical data relative to the available water supply and irrigable areas in the Colorado River basin to be used in the adjustment of the claims of the various states for power and irrigation. This adjustment is to be made by the Treaty or Compact Commission which has been created by the legislatures of the several states and the Congress of the United States.

The Colorado River Commission has no work before it at present except the collecting of the data above mentioned for the use of the Treaty Commission. The treaty commission can be ready to function as soon as the President appoints the government member, as all the states interested have already acted. In five of the states, I believe, the members of the Treaty Commission are members of the River Commission, and it is expected that the River Commission will act as consulting engineers for the Treaty Commission.

The public has been informed of some of the objects of these commissions. They are to get rid of the interminable, expensive and exasperating litigation that will surely occur unless such action as contemplated by the commission is taken. With such a compact entered into by all of the states and the federal government, development may go on uninterruptedly in all the states and in an orderly manner.

The United States Reclamation Service has already collected sufficient information relative to the water supply of the basin to show that there is enough water for the irrigation needs of the whole basin if properly handled. Consequently irrigation development in any particular territory need not be halted to any appreciable extent.

The power problem is somewhat different. We assume that irrigation should take precedence over power, since in a large measure, taking the basin as a whole, much of the territory will be without a market for power unless there is irrigation development. But large power units cannot be developed without great storage basins. In most cases it is hoped these can be planned so as to be utilized both for power and irrigation, and in such cases both interests can share in the cost of construction and maintenance. There may arise some delicate problems in this connection which will have to be ironed out, and the River Commission should be able to give material aid.

Looking to the operation of this basin as a whole, the configuration of the country is such that the various irrigation units can be operated independently and should by all means be so operated, but we can conceive of a time when the water power of the basin may

give the best service by being tied together and operating as a unit.

These problems must be treated in a liberal and unselfish manner. It is a problem that should be given our best and most conscientious thought, and selfish extremists on one side should not scheme to prevent development by the other.

A. J. McCUNE,
Chairman Colorado River Commission and
Denver, Col. Colorado State Engineer.

Future of Vacuum Tube in General Engineering Field

To the Editors of the ELECTRICAL WORLD:

From my personal observation it appears that the profession is inclined to look upon vacuum-tube development with more or less indifference. Of course, every engineer must admit that the application of the electron or vacuum tube to the art of radio communication has brought about a revolution in that field, but it would seem that the vacuum tube is going to experience the period of doubt and criticism that other great inventions have weathered, since the mere mention of the possible entrance of this device into the general engineering field brings forth a storm of objections. There appears to be a lack of vision and foresightedness on the part of many men who are so seasoned with experience and practice that they are unable to appreciate the possible application of a device more or less shrouded in theoretical calculations.

That the electron tube is a real healthy youngster well worth watching there is no doubt. But a very short time ago it was just able to take a few milliamperes as a regular diet; then it grew up and now it is able to digest no small number of amperes, and Dr. Hull of the General Electric Company believes that it will soon have an appetite that will have to be satisfied with kiloamperes. When it reaches the last stage it will be an engineering device of no mean importance looking for a place in the affairs of the electrical field.

Will the perfection of the electron tube usher in a new era of direct-current application? To some this may sound like the rankest kind of idle speculation, but to those of us who have kept our eyes on vacuum-tube development the suggestion is at least alluring. The writer does not mean to infer that the vacuum tube as a rectifying device is going to abolish the use of alternating current. He simply means that it will be possible to use direct current where it is most needed and where its place is being taken today by alternating current for good engineering reasons.

The supremacy of the direct-current motor for locomotion is well known and the reasons are well understood. Will it ever be possible to install a battery of vacuum-tube rectifiers on an electric locomotive and operate the driving motors with direct current from an alternating-current line as a source?

The power substation offers another possible field for the application of the vacuum-tube rectifier. Here it would replace the costly synchronous converters. It almost sounds too good to be true to say that a few glass tubes tucked away on a shelf will replace a machine that would cost several times as much as the tubes.

High-voltage direct-current transmission is the most interesting phase of the question to be considered. At this point it might be well to quote Dr. Hull of the General Electric Company: "Twenty years will see direct-current transmission lines, fed through transformers and kenotrons at any convenient points by alternators of any frequency and tapped by the same tubes, acting as magnetron alternators, or some equivalent pliotron or combination vacuum-tube alternator." It is certain that the use of high-voltage direct current would be a remedy for most of the ills of our present-day long-distance lines. The serious power losses now caused by inductive effects, capacity effects and "skin effects," with the consequent fluctuations in line voltage, would be entirely abolished.

The use of vacuum tubes in the electrochemical industry is also another possibility. However, special conditions exist in this field, and the tubes that are being developed at present could not be applied to this work since they are essentially high-voltage devices and electrochemical service calls for a low-voltage tube. Tubes, as they stand today, can be operated on low voltages, but their efficiency falls off rapidly. It is more than remotely possible, however, that a low-voltage rectifier will be perfected that will function with reasonable efficiency. Perhaps a vapor tube of some sort will find use in this work.

Although the efficiency of vacuum-tube rectifiers is low when they are operated with low voltages, the efficiency increases rapidly with increases in voltage. Engineers who are at work in this field see no reason why tubes cannot be made to operate with an efficiency as high as 99 per cent.

There are a thousand and one other applications of the vacuum tube that cannot be mentioned in the space of this letter. The whole thing deserves the careful thought of every engineer. What is needed is more tolerance and patience on the part of those who are skeptical. There were probably a great number of skeptics when Tesla brought forth his induction motor. Will history repeat itself? Already the vacuum tube has got past the stage of being a scientific plaything, in which light many engineers have regarded it. It has reached a stage where at least its possibilities must be recognized.

RAYMOND FRANCIS YATES.
New York City.

Unifying Great Britain's Electric Service

To the Editors of the ELECTRICAL WORLD:

One of the most remarkable pieces of reconstruction work undertaken by Great Britain since the war is being carried out by the Electricity Commission. It aims at establishing one great electric service system which, with minimum coal consumption and standardization of generating systems, frequencies and pressures, shall supply the manufacturing and domestic needs of the entire country. So far as possible these stations will be set up near mining areas to insure cheap transportation of coal. The reduction of costs will be reflected in the prices of all manufactures so that England should be better able to compete with world markets than at present. Besides, labor conditions will be greatly improved.

In the course of time it is safe to say that a great part of Britain's railways will be electrified. The saving will be immense, because of the amount of coal and labor now required to run them. When that period of development has been reached it will be possible to supply electric service to the country each side of the lines and to reduce the manual labor now demanded there.

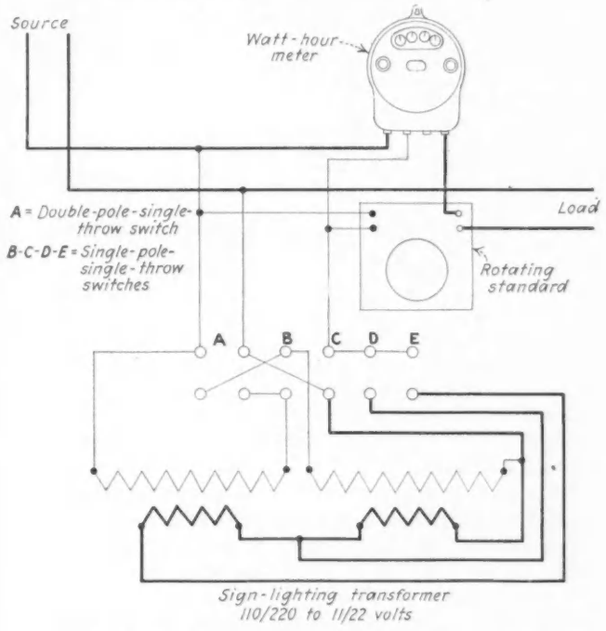
MARK MEREDITH.
Liverpool, England.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Econor. ical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Testing Meters to Prevent Creeping on Abnormal Voltage

AFTER experiencing considerable difficulty from meters creeping while in service and finally tracing the trouble to high voltage on some of the lines, the Alabama Power Company adopted a simple and inexpensive method of testing all meters for creeping on voltages as high as 20 per cent above normal. The result is that not a single meter installed during the past eight months has been reported as creeping on no load.



CONNECTIONS FOR TESTING METERS FOR CREEPING ON ABNORMALLY HIGH VOLTAGES

Line Volts	Switches Closed	Volts on Meter	Voltage Raised, per Cent
110	C	110	0
110	B & D	115.5	5
110	A & D	121	10
110	A & E	132	20
220	C	220	0
220	B & D	231	5
220	B & E	242	10

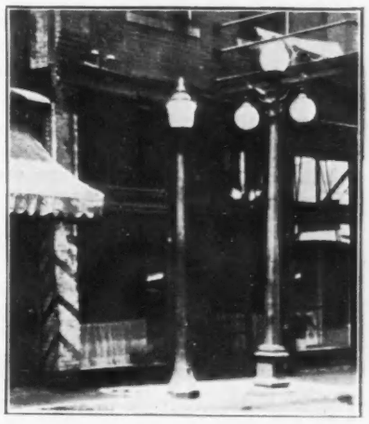
An ordinary sign-lighting transformer (110-220 volts to 11-22 volts) was installed in the potential circuit of each meter-test bench as shown in the accompanying sketch. The primary coils were arranged for either series or multiple connection by means of the switches *A* and *B*, and the secondary coils were connected in the familiar booster manner to raise the voltage 5, 10 or 20 per cent. The opposite effect of lowering the voltage can be obtained by reversing the connections of the secondary coils.

In practice the meters are first tested for creeping at ordinary line voltage with no load; next the regular test is made, and finally they are again tested on no load but at 10 per cent above normal voltage. The table shows voltages obtainable by this method.

J. B. RIVES,
Alabama Power Company, Meter Department.
Birmingham, Ala.

Single-Lamp White-Way Posts Supplant Cluster Lights

DURING the past year the small cities and towns throughout the Middle West have shown a very gratifying interest in improved ornamental illumination for their streets. Many of these towns have never had any form of street illumination other than relatively low-intensity overhead fixtures at street intersections, but the majority of them are interested in replacing obsolete and inefficient systems of ornamental lighting with more modern equipment. The old style cluster post operated on low-voltage multiple circuits and manually controlled, individually or in small groups, was very popular ten or twelve years ago—so popular, in fact, that it is still difficult in some localities to convince the prospective buyer that it is not the most suitable and attractive post. However, in the majority of cases the installations made in recent years have been of single-lamp units similar in design to that shown in the photograph and operated on series, constant-current circuits. Chief among the advantages of this system are increased illumination at a lower power consumption and lower maintenance cost due to this and to less glassware and fewer lamp renewals. A typical instance presents itself in the town of Marion, Ill., where a cluster-post installation had been in operation for a number of years. The cluster posts had been installed without particular regard for uniform illumination or symmetrical appearance, and their operation was made difficult for the reason that there was no central point from which all the units could be controlled. These obsolete units were recently removed, and in their place were installed single-lamp posts equipped with 2,500-lumen 6.6-amp. series units. In the illustration the cluster post and the single-lamp post replacing it are shown side by side.



NEW SINGLE-LAMP DECORATIVE POST TAKING PLACE OF OLD CLUSTER POST

These units are operated on six series circuits fed by

three 24-kw. 6.6-amp. constant-current regulating transformers, each transformer being arranged to carry two circuits, one circuit burning all night and the other part of the night. Each circuit is only partly loaded so that there is ample capacity for making extensions in any direction by simply extending the cable and adding lamps as required.

The regulating transformers are virtually automatic in their operation, requiring no attention other than the opening and closing of the switches by a patrolman. Each outgoing panel is equipped with a 10-amp., 4,000-volt self-contained ammeter so that the secondary or lamp current in each pair of circuits may be read separately and a close check kept on the operation of the system. The main panel is provided with a full automatic oil circuit breaker with overload trip and under voltage release and also with an integrating watt-hour meter.

The ornamental standards are of cast iron, as this material is believed to be the most durable commonly used in ornamental post construction and at the same time lends itself readily to manufacture in pleasing shapes and designs. It is of interest to note that the cluster posts, which were also of cast iron, showed no appreciable deterioration after years of service, but were apparently in as good condition as when installed. It was first decided to use concrete posts, but after a thorough study of numerous installations of both concrete and cast-iron posts the specifications were rewritten for cast-iron ornamental standards. Further considerations were that the greater wiring space within the cast-iron post enables the use of safety devices and at the same time facilitates wiring. The cast-iron post is also more easily replaced in case of breakage due to a street accident.

The single-lamp standard is approximately 11 ft. (3.3 m.) in height over all. It was found that this height harmonized best with the building heights and gave a reasonably wide distribution of the light. An opal or diffusing top is used which avoids glare and gives a pleasing effect to the light. In this way the lighting units are not mounted so high that the ornamental and decorative effect is lost. There seems to be a tendency in some localities to ignore the fact that an ornamental lighting installation is intended primarily for ornamentation. This is sometimes lost sight of in attempting to obtain the very widest possible distribution and the maximum uniformity of intensity.

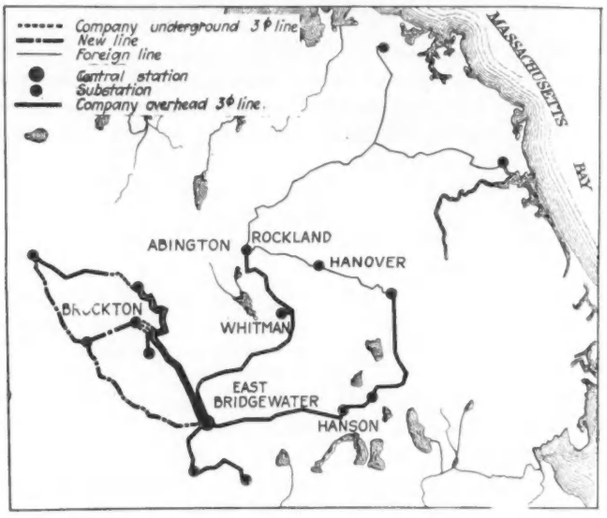
Westinghouse Electric & Mfg. Co., P. Y. DANLEY,
East Pittsburgh, Pa. Lighting Specialist.

Increasing the Reliability of Energy Supply

IN THE development of a territory such as that served by the Edison Illuminating Company ring transmission has proved to be very valuable in assuring continuity of service and permitting repairs to be made on sections of the line without interrupting service.

Originally the territory was fed from a single two-circuit line, but as the load steadily grew the two circuits rapidly approached the limit of their capacity. Moreover, being on a single-pole line, repairs were difficult to make without serious inconvenience through shutdowns. Consequently increased capacity over an alternate route became necessary.

A study of the territory and its probable growth led the company to believe that a new line running from the East Bridgewater generating station to the Stoughton substation and passing through the west side of Brockton would be of the maximum advantage. It was found that a connection could be made from the central Brockton substation to this line at a switching and transformer station to be erected on the line at the point where it came nearest to the center of the city. A study of the transmission plan shows that this line with its Brockton connection provides a ring feed through Brockton by way of the new and old lines and a larger ring through



RELIABILITY OF TRANSMISSION SERVICE IN INDUSTRIAL SECTION INSURED BY FEEDING WITH LOOP SYSTEM

Stoughton and the northern industrial section of Brockton.

This meant that any of the substations in this district could receive energy from either direction and that any section of the line could be cleared, if made necessary by trouble or for ordinary maintenance work, without interrupting service at any point.

A private right-of-way was acquired and this line was built during 1920. As erected it is a wooden-pole line with 125-ft. (38-m.) spacing. It is armed to carry two circuits, but for the present only one has been run. This consists of three No. 1/0 stranded bare copper conductors run in triangular position on one side of the poles. The arms are long-leaf pine, 3¾ in. x 4¾ in. (9.5 cm. x 12 cm.), with wooden pins on the straightaways and malleable iron on the angles. The insulators are Locke No. 2012. No overhead ground wire was run. Considerable grading of poles was necessary, but the basic size was 30 ft. (9 m.), this small size being made possible by the fact that the entire line is on private right-of-way.

The connection to the Brockton substation is by cable, partly overhead and partly underground. The route followed is one of the main thoroughfares to the center of the city and the use of open wires was impossible. The cable is three-conductor No. 4/0 varnished-cambric-insulated, the underground portion being lead-covered and the aërial section steel-armored. The cable operates at 13,200 volts nominal pressure. There is nothing unusual in the cable installation. All lines are underground in the central portion of the city, the company's duct lines running out about one-half mile from the main substation. It was easy to use these as far as they extended. With construction costs at their recent level, the

company hesitated to build additional duct lines for the remainder of the route and, in fact, felt that an aërial cable would be equally satisfactory .

The overhead line is just under 11 miles (17.6 km.) in length. It traverses much swampy land which made construction difficult, and the work was done when labor conditions were at their worst. The result was that costs were higher than had been hoped would be the case.

The switching and transformer structure was built to care for two through circuits, two cables to Brockton and two step-down transformer banks, with a building to house the 2,300-volt distribution panels and equipment. Only the control and metering equipment for the 2,300-volt distribution was housed, the other apparatus being of the outdoor type. The cable to Brockton is not yet complete, but the company expects to do the work this coming summer.

The ring feed has already proved itself most valuable, permitting repairs to be made on the old Stoughton line during regular working hours without interrupting the service.

W. A. FORBUSH,
Plant Superintendent.

Edison Electric Illuminating Company,
Brockton, Mass.

Adapting a Small Hydro-Electric Plant to Semi-Automatic Operation

RECENTLY it became necessary to adopt a 75-kva. hydro-electric plant where water was available only half the year to semi-automatic operation. The generating equipment was about quarter of a mile distant from the main station. Remote control from the latter was investigated, but was given up on account of expense. Therefore the semi-automatic scheme of control illustrated in the accompanying diagram was adopted, the plan being to start and stop the plant manually, but to do away with attendance during the running period and to get the utmost possible use out of the water. It was decided to take the risk of trouble from hot bearings or windings, depending on periodic inspections for indications of abnormal conditions.

The plant consists of a 90-hp. horizontal turbine belted to a 60-kw., three-phase generator having a direct-connected exciter. The control connections are taken from the line side of the automatic generator oil switch. The circuit passes through a three-pole main switch from which the middle leg is carried to a 550-volt, three-phase gate-controlling motor. The two other legs connect with two limit switches arranged to open against a spring by a dog attached to the hand wheel of the gate mechanism. From these the wires run to a double-throw float switch operated by a float in the forebay.

When the water in the forebay rises to a predetermined height the float trips the switch and causes the motor to open the waterwheel gate until the dog engages the arm of one of the limit switches and opens it, thus leaving the gate in this position. When the water in the forebay drops, the float throws the float switch into the opposite position, which is so wired as to reverse the motor and close the gate until stopped by the other limit switch.

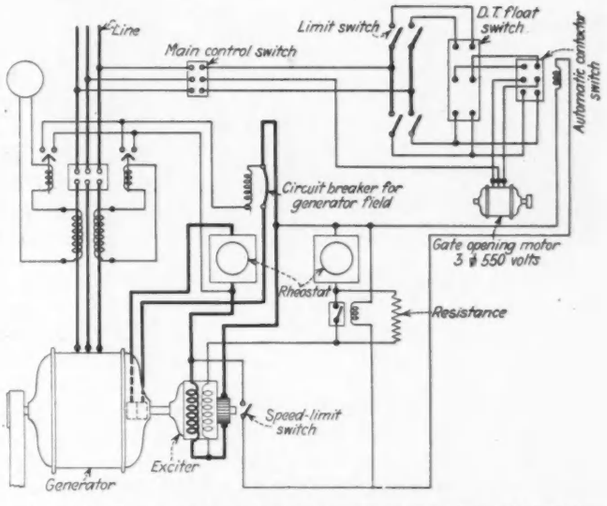
In order to prevent overspeeding of the generator when load is suddenly removed at full gate opening, an automatic contactor switch is placed in the closing side of the motor and so arranged that when it operates it will cut out the float switch. The voltage controlling this automatic device is obtained from the exciter through a speed-limiting device attached to the shaft of the generator.

To prevent excessive voltage while the generator is running at high speed a resistance is placed in series with the shunt field of the exciter. This resistance is normally shunted by an automatic circuit breaker, which also receives voltage for its operation from the exciter through the speed-limiting device. When the generator speeds up above normal the limiting device acts to close the contactor switch, thus lowering the speed, and at the same time opens the circuit breaker, throwing the resistance in series with the shunt field of the exciter. This position is maintained so long as the speed is above normal, but as soon as the gate has been closed to reduce the speed to normal the speed-limit switch ceases to act and the contactor and circuit breaker return to normal position.

An automatic circuit-opening hand-reset circuit breaker with field-discharge clip is placed in the generator field circuit and its operating coil connected to the exciter through contacts on the circuit-opening relays of the main oil switch, so that if any trouble occurs on the line or in the generator sufficient to open the main oil switch it will also kill the generator field and voltage cannot again be obtained until an examination has been made by an operator and the generator field circuit has been closed.

Voltmeters and synchronizing apparatus are installed at both ends of the line, and at the lower end is an indicating watt-meter with a zero-center scale.

Although this scheme does not include all the protective apparatus generally supposed to be necessary for an automatic station, it was considered satisfactory for this installation, especially as its expense is not prohibitive, for it can be assembled from standard apparatus. The development of reliable equipment of this kind which can be installed at a reasonable price should have a stimulating effect upon the development of the small water powers throughout the country.



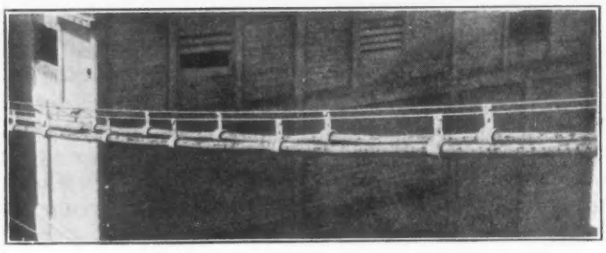
ARRANGEMENT OF GENERATING PLANT WHICH REQUIRES NO ATTENDANT WHILE RUNNING

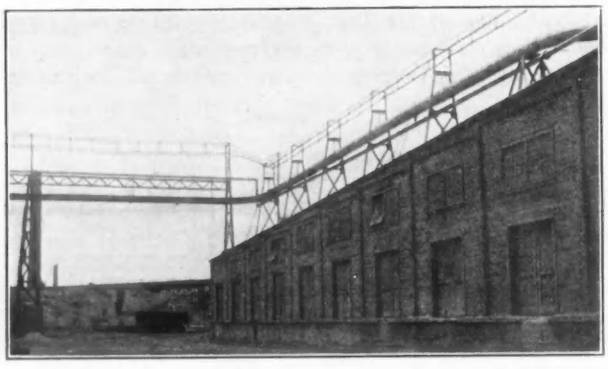
I. W. PHILLIPS,
Electrical Engineer.

Perry & Whipple, Consulting Engineers,
Providence, R. I.

Revising Distribution System of Industrial Plant

THE distribution system of a growing industrial plant which uses a relatively large amount of power should be checked at frequent intervals and should grow in proportion with the load. With the low voltages customarily used for these systems the distribution system usually does not allow sufficient margin for large increases in load without a corresponding increase in the feeders. An underground-duct system, with its absence of overhead wires, gives probably the most nearly ideal solution of the distribution system for the average industrial plant. Especially with low voltages, a point is finally reached in a system of this kind where the aggregate heating effect of the cables will reduce the current-carrying capacity to a point at which it is not economical to add more copper unless the duct runs are split into two or more separate runs with





HEAVY THREE-PHASE CABLE FOR INDUSTRIAL-PLANT DISTRIBUTION SYSTEM

Above—Cable supported by split porcelain insulators attached to steel messenger. Below—Extensions to pipe supports hold up messenger wire.

sufficient space between to avoid heating between runs. Heating depends upon the current carried, and thus a limiting amount of power per run will be reached more rapidly as the voltage is reduced. When a duct system approaches this point cable temperatures must be carefully watched as unsafe temperatures will be reached at current densities far below the rated carrying capacities of the individual cables. Owing to the low utilization efficiency of the copper, it is sometimes economical to adopt other measures, and it may prove advantageous to step the voltage up and down again for comparatively short distances.

In a recent survey of one industrial-plant distribution system using an average load of approximately 2,500 kw., at 440 volts, three-phase, 60 cycles, with an underground-duct system and paper-insulated, lead-covered cables, the following conditions were found: Much additional load had been added since the cables had been checked. Some old-type, low-speed motors gave a very low power factor on a portion of the feeders. The cables were being operated at currents closely approximating the limiting values for paper insulation in the tables given by the National Board of Fire Underwriters. The manholes had not been opened or the cables inspected for several years. The cables were operating at some points with a temperature of 130 deg. C., which would cause rapid deterioration of the insulation. The insulation had been damaged to a considerable extent. The total number of large cables in the ducts was such that the aggregate heating effect allowed a rather low current-carrying capacity in order to maintain a safe operating temperature in the ducts. Manhole ventilation could not readily be applied. Furthermore, a considerable amount of additional load was contemplated for the immediate future.

In studying the various possible solutions of this problem the cost of replacing the damaged cables and the addition of sufficient copper to carry the load without undue heating appeared prohibitive as an additional duct run would have been necessary. Somewhat less copper but a greater total outlay would result from replacing the duct run by a cable tunnel cooled by natural draft. Overhead construction for carrying the low-voltage cables was considered and discarded for several reasons. The weight to be carried would necessitate heavy structures. The large number of heavy cables would require a considerable overhead space, which could not readily be arranged. A locomotive crane was used quite generally around the plant; therefore overhead construction would probably be a nuisance. Large quantities of dust were produced which would accumulate and add considerably to the weight to be supported.

Stepping the voltage up to 2,300 would greatly reduce the copper required and offered the advantages of a reasonable cost, better deliveries of equipment, more nearly standard equipment and greater flexibility. The average feeder length was less than 800 ft.; and thus 2,300 volts was sufficiently high for satisfactory transmission and in addition presented some other advantages. Several large motors rating up to 400 hp. were to be added. With motors of this size 440-volt starting and control equipment is cumbersome and expensive and the higher voltage will be decidedly advantageous. In laying out the new work plans were made for the ultimate conversion of the entire system to 2,300 volts, including the rewinding of some of the larger motors. The demand has grown to approximately the full rated generating capacity of the power plant, and any extensive future growth will require additional generating equipment. A generator of from 3,000-kw. to 5,000-kw. rating at a voltage less than 2,300 is not desirable. Thus the introduction of higher voltages at the present time is merely anticipating a necessary move of the future if present plant growth is to be maintained.

Transformer capacity was determined by future as well as present requirements. Two groups consuming approximately 40 per cent and 50 per cent seemed a logical division of the load to be transmitted. The difference in the power factors of the two groups brought the kilovolt-amperes almost to an equal figure on both groups. In laying out the initial installation it was planned to feed the first group from one step-down station and to rearrange the old feeders to give additional copper to the departments in the second group. Six duplicate transformers of 500 kva. capacity, single-phase, 2,200/440 volts, with 5 and 10 per cent taps on

the high-voltage side, were installed, three in each of the substations. As there was some doubt as to the location of future stations and as the step-up station was designed for an outdoor station, all the transformers were of the outdoor type. At such time as it becomes advisable to extend the 2,300-volt transmission the present step-up bank will be moved to the location for the second step-down station and a larger bank installed for the step-up station.

The location of the 2,300-volt lines between the stations was a rather stiff problem. For reasons already stated it did not appear advisable to install them overhead. The last duct in the cable system was filled and overloaded, a condition which could not be relieved until after the new lines were in operation. At this time deliveries were very poor on any type of cable. Sufficient 500,000-circ.mil, three-conductor cable was finally obtained for immediate delivery. This cable was not exactly what was desired, but it could be used. It was built to the following specifications: $\frac{3}{32}$-in. varnished-cambric insulation, $\frac{3}{32}$-in. varnished-cambric belt and tape and weatherproof braid finish. Obviously this cable could not be pulled into a duct system where partial submergence in water might be expected at times.

An overhead route was finally selected which apparently would cause comparatively little interference with operations of the locomotive crane. The general line of the steam main from the waste-heat boiler plant to the power plant was followed. Structural-steel extensions were placed on the pipe-line supporting towers, and $\frac{3}{8}$-in. seven-strand galvanized-steel messenger wire was stretched along the top of the extensions, the power cables being suspended from the messengers like telephone cables. The messenger was run continuously between dead-end points and was secured to the top of the towers by means of "J" bolts. The pipe-line supports were placed with average centers of 20 ft., which gave rather short spans for this type of construction. With a tight messenger and these short spans the sag was very small.

In order to provide some additional insulation and to prevent chafing, split-porcelain cable-clamp bushings were used at all points of support. Standard iron cable clamps were used around the porcelain bushings at the towers to prevent side sway. The intermediate span hangers were made of strips of galvanized sheet iron formed into the correct shape. A loose fit was obtained so that they were free to slip along the messenger in case of expansion or contraction.

At some points it was necessary to pass the cable through some of the buildings. At such points a form of conduit construction was used. As the runs included no bends, a piece of 4½-in. steel well casing was placed in position. This was lined with 3½-in. fiber conduit, which made a tight fit inside the casing. The cable was then drawn through the conduit. The ends were closed by means of split bushings which were made of treated hard wood.

Splices were made at several places in the line. A piece of 3½-in. fiber conduit approximately 30 in. long was first prepared with treated hard-wood bushings of suitable size for a slip fit on the cable. The bushing and conduit were slipped over the cable ends. A standard sleeve joint splice was then made in the cable and insulated. The conduit was then slipped over the joint and both bushings were driven into the ends. All openings were filled by calking in friction tape. The joint was then poured full of a standard joint compound, and the filling openings were closed by wrapping with waterproof tape. The method was designed to follow as closely as possible the construction of the wiped joint in a lead-covered cable. The completed joint makes a very neat appearance and is far superior to the taped joint for large cables. The joint is more quickly made and the material cost considerably less than the taped joint.

No operating troubles have been encountered to date, and the installation is giving highly satisfactory service. The actual construction costs were considerably below the estimated cost for the customary type of overhead construction, although the cable used was somewhat larger than that called for by the original designs. The design and construction were rushed to relieve a pressing situation, and plans were radically altered where necessary to fit material available for immediate shipment.

T. H. ARNOLD.

El Paso, Tex.

Steam-Storage Locomotive Successful for Shifting Coal Cars

FOR switching freight cars and other material a fireless steam-storage locomotive has been found very satisfactory by the Union Gas & Electric Company, Cincinnati, Ohio. On one charge the locomotive makes six to eight round trips (900 ft. and return) hauling three cars of 35 tons load each, weighing 28 tons empty. About 450 ft. of the trip is over a 2 per cent grade in combination with a 40-deg. curve. The remaining 450 ft. is straight and level. Three loaded cars are hauled on the up grade and three empties on the down grade, this making the round trip. Thus from 630 to 840 tons of coal will be handled per charge.

The locomotive, which was made by the H. K. Porter Company, Pittsburgh, is used for various purposes. When the railroads were hard pressed it was sent out to the nearby railroad yards, where it was connected to five or six loaded coal cars of 50-ton capacity and successfully brought them into our yards. It does miscellaneous switching of cars containing material and parts for our construction forces.

The locomotive is charged from a suitable connection provided alongside the track, the steam coming from our regular boiler plant at the West End Station, where this locomotive is in service. The charging periods are not regarded as a nuisance. The locomotive holds before charge 25,000 lb. of water. Steam at 250 lb. pressure and 200 deg. Fahr. superheat is fed in from the station boilers until there is a pressure of 225 lb., saturated, and a temperature of 397 deg. Fahr. in the locomotive. If the initial condition of the boiler is 312 deg. Fahr. temperature, 65 lb. pressure, 60 lb. (weight) of steam, the charge requires 2,400 lb. of live steam and the locomotive holds 27,400 lb. of water and 60 lb. (weight) of steam. Assuming an evaporation of 7.5 lb. of steam per pound of coal, a charge requires approximately 320 lb. of coal. This is approximate in that it does not take into consideration heat supplied or changes in weight of steam, but the latter are very small percentages of the total. The traction force is at least 20,800 lb. with the 40.-in. driving wheels. The weight of the engine is 45 tons.

C. W. DE FOREST,
Manager Electrical Department.
Union Gas & Electric Company,
Cincinnati, Ohio.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Allowing Customers to Finance Line Extensions

BY "KASSANDRA"

THOUGH Mark Twain was not an electrical engineer, yet his account of Tom Sawyer and the whitewashing of the fence shows a grasp of a sound principle. Tom was annoyed when his aunt told him he must whitewash the fence. After he had started to work Tom let the other boys see how interesting it was to whitewash a fence until they wanted to take the job off his hands.

A recent commission decision was to the effect that a company should not require customers to finance extensions, but is there any reason why they should not be allowed to?

If a customer finances an extension by depositing with or loaning to the company the cost, the company can afford to pay a rate of return at least as high as it earns on its investment. Further, if it is agreed that the return or interest on the deposit or loan shall be paid only out of the income from that extension, the company can afford, when there is enough income, to pay a higher rate of return because the company is relieved of any obligation to pay the return if the extension is not profitable.

If the customer deposits the cost of the extension, the company has no initial outlay. If the company then keeps, say, one-half the gross income in ordinary cases (or perhaps two-thirds or four-fifths if the supply is to a large customer at a low rate per kilowatt-hour), the company gets cash to cover the increase in operating expense because of the energy supplied. So long as the initial cost is deposited by the customer and, say, half the gross income is retained by the company, the transaction needs no cash.

The balance of the gross income can then be applied, first, toward paying, say, 10 per cent on the deposit. If the use or gross income is small, there may not be enough to pay 10 per cent, but the company does not suffer, because it is not the company but the customer that has invested the money.

If, on the other hand, the gross income is so large that the company after reserving, say, one-half for operating expenses has enough left to pay 10 per cent and something more, the company can then gradually return the customer's deposit or pay off the loan just as it would have done if it had obtained the money from the bank. For various reasons it would be desirable to put a limit of time, say seven years, so that if at the end of seven years the deposit or loan had not been repaid in full, there should nevertheless be no further payment by the company, but after the seven years the company should retain all the income. In the ordinary case, however, the deposit or loan would be repaid long before the seven years was up.

If the customer was not in a position personally to finance the extension, he could nevertheless often arrange for it, as he could well afford to pay 6 per cent if he were going to get 10 per cent from the company on the extra amount.

It will be asked: "Why pay a customer 10 per cent for financing an extension when the bank will loan the company money at 6 per cent?" One reason is that the bank wants its 6 per cent and also wants its money back even if the extension is unprofitable, while the customer gets his money only out of what he pays for electricity. If the extension is unprofitable, it is the customer who loses, while if the company had borrowed the money it would be the company that would lose.

In the days of high money rates a company hesitates to solicit business which requires it to raise money, but it can well afford to solicit business on the terms described above. Such contracts should be very attractive to many prospective customers and can be taken without any risk.

The point is that though it is usually unwise, and under the commission decision above referred to is unlawful, for a company to require its customers to finance extensions, yet, on the other hand, a company can wisely permit customers to finance their extensions and can make such financing very attractive—so attractive, in fact, that the customer who is going to use the service may even get the money from his bank if he has not the cash on hand. The chief point, however, is to make the financing by the customers permissive and attractive rather than obligatory.

Electrical Equipment of a House Adds 25 per Cent to Selling Value

THE recent sale of the Louisville (Ky.) electrical home proves conclusively how complete electrical equipment of a house enhances its actual selling value by at least 25 per cent. Built to sell for $11,000 to

CROWD AT AUCTION OF LOUISVILLE ELECTRICAL HOME

$12,000, the home, which was promoted by the Electrical Club of Louisville and the electrical interests of the city, was sold at auction for $15,025 without furnishing.

The extra price secured for the home is laid to the

added appeal of the electrical equipment and conveniences. More than 15,000 people visited the home during the week's public exhibition, and on the day of the sale the house brought at auction $3,025 above the original maximum price.

Good Advertising Gone Wrong

IN THIS advertisement clipped from a newspaper in a certain city electrical appliances are offered at figures ridiculously lower than list prices. Moreover, the regular price of each appliance is stated and directly accompanying this is quoted the sale price of one-fourth to one-half that amount—one-hundred-dollar vacuum cleaners for $25, four-dollar electric flatirons and toasters for $2 and others almost as bad. At a time when every one in the electrical industry is striving to build up and standardize merchandising methods the advertisement comes as a startling reversion to old practices.

Ten Day Sale of Electrical Appliances

We have on hand a quantity of appliances, some of which are shopworn, that we are offering at and below cost for 10 days beginning October 20th. These appliances are all in good operating condition. The following articles will be included in this sale:

	Were	Sale Price
Water Sterilizers	$ 7.50	$ 4.25
Vacuum Cleaners	49.50	28.00
Vacuum Cleaners	50.00	25.00
Vacuum Cleaners	100.00	25.00
Vacuum Cleaners	40.00	21.00
Fireless Cookers	45.00	24.00
Hylo Mazda Lamps	1.00	.85
Hylo Carbon Lamps	.50	.28
Ovenettes	7.50	5.15
Heating Pads	8.00	5.00
Electric Ranges	165.00	112.00
Porcelain Toasters	4.00	2.00
6 lb. Irons	6.00	3.50
6 lb. Irons	4.00	2.00

A MIS-STEP IN ADVERTISING

It is stated in the advertisement that some of the appliances are shopworn and that the sale prices are below cost. But this statement is in small type and is an explanation that does not explain. The result is that these appliances are belittled by price cutting. Into customers' minds comes the question whether these appliances, if they are shopworn, were ever worth their original prices, or whether, if appliances can be sold for such prices, there must not be an enormous profit in electrical merchandise.

Such advertising may sell some appliances, but it is demoralizing to the local trade and worse for the public. True, stocks must be moved and shopworn devices can legitimately be sold for what they will bring. But the public must clearly understand the circumstances so that it will not confuse the value of a modern electrical device with that of a ten-year-old type of the same appliance.

Selling $364,000 of Preferred Stock to Electric Appliance Customers

SINCE January this year $364,000 par value of the Northern States Power Company's preferred stock has been sold to 600 of the persons who visited the company's Minneapolis salesroom to look at electric appliances. This is in addition to the ordinary sales by the securities department in that city, and it was accomplished by means of a sign, a desk and a man to answer questions.

Last winter T. C. Erringer, manager of the department, observed the large number of customers shopping daily in the electric appliance display room and decided to call their attention to the company's stock as an opportunity for investment. Results far surpassed all expectations, and the sale of stock in the display room has become as permanent as the sale of electric appliances.

Here is a fine example of the fact that the sale of stock to customers has become as much a part of the electric utility's service as is the supplying of electrical energy or the sale of electrical merchandise. The shopper should be enabled to investigate and purchase stock in the utility as easily as he inspects and buys a flatiron or a vacuum cleaner. Selling a few shares of stock to a customer in the display room is easier, too, because he is in the buying mood, and when he is sufficiently interested to make an inquiry he is already half sold.

What Other Companies Are Doing

Shell Rock, Ia.—The Shell Rock Electric Light & Power Company is having a report prepared by Holland, Ackerman & Holland, consulting engineers of Chicago, concerning the projected construction of a hydro-electric plant at Shell Rock. Definite plans will be formulated after the report is completed some time next spring.

New England.—Power engineers in New England working with the divisional N. E. L. A. organization are preparing a list of manufacturers classified under different industries which will give the names and addresses of a large number of representative concerns in different parts of the country that are using central-station service. Many central-station executives believe that in negotiating contracts for power service it helps materially to show the prospective customer a list of names of concerns in his own business which are buying energy from public utility companies.

Reading, Pa.—More new contracts to supply electric light and power are being signed now than at any previous period in the history of the Metropolitan Edison Company. As the same time, the company is again giving employees and customers an opportunity to share in its earnings through an offering of its 7 per cent cumulative participating preferred stock. The stock may be purchased for $93 a share cash or for $95 a share under a five-dollar monthly payment plan. In April, 1920, the same plan resulted in a total subscription by customers and employees of $600,000 of stock.

Illinois.—Cash sales of electrical merchandise by the Public Service Company of Northern Illinois during the first nine months of this year were $406,000. Although a slight decrease is shown as compared with the same period in 1920, it is because of the drop in appliance prices. Moreover, while the cash sales have decreased the time payment sales are increasing and the number of sales of the most popular appliances, namely flatirons, toasters, grills, percolators, chafing dishes, vibrators, fans and portable show increases. Vacuum cleaner sales increased from 1,436 in 1920 to 1,738 in 1921 for the nine-month period.

Ashland, Ohio.—Believing that "eating is learning," T. C. Brill, commercial manager of the Ashland Gas & Electric Light Company, staged a demonstration of electric waffle irons in the company's store at a time when customers were coming in to pay their light bills. A series of three letters had previously been sent out to a selected list of women inviting them to attend the demonstration. As each visitor entered the store she was greeted by a demonstrator, was seated at a table and was served with waffles cooked on the table before her. No attempt was made to sell appliances, but each visitor was asked to write her name and address on a card. These made an excellent mailing list of prospects for waffle irons and other appliances.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generation, Transmission and Distribution

Locating Faults in Direct-Current Single-Series Windings.—B. A. BRIGGS.—This article explains the requirements for single-series armature windings, effects of open circuits, how to test and locate these defects, and methods of repairing open circuits.—*Power*, Nov. 1, 1921.

Commutation on Direct-Current Machines.—CLAUDIUS SHENFER.—A discussion of the design features of commutators with relation to decreasing reactance voltage. Experimental data are given to prove the theoretical statements.—*Journal A. I. E. E.*, November, 1921.

Hydro-Electric Developments in Foreign Countries.—F. ROWLINSON.—An article discussing the principal hydro-electric developments in other countries which by their size or originality are of especial interest. The countries taken up are Norway, Canada, Australia, Tasmania, New Zealand, India, Switzerland, Spain, Italy and the nations of South America.—*Beama* (British Electrical and Allied Manufacturers' Association), October, 1921.

St. Lawrence Waterway Project Report.—W. A. BOWDEN and Col. W. P. WOOTEN.—The text of the engineering report on canalization and power development submitted to the International Joint Commission. This particular report deals with Divisions No. 4 and No. 5 and ice conditions on the St. Lawrence River.—*Canadian Engineer*. Oct. 6, 1921.

Queenston-Chippawa Power Scheme.—A discussion especially of the difficulties in constructing the canal and a description of the hydraulic equipment installed in the plant being built at Queenston.—*Electrical Times*, Sept. 22, 1921.

Lamps and Lighting

Car Lighting by Electricity.—CHARLES W. T. STUART.—A description of one type of safety lighting equipment used on railroad cars.—*Railway Electrical Engineer*, November, 1921.

Railway-System Lighting.—J. H. KURLANDER.—A treatise on the proper light intensity, quality and distribution for railway shops, stations, yards, etc. The foot-candles necessary for proper lighting and the different types of units and desirable spacings are listed for all of these locations, including roundhouses, erecting shops, car shops, foundries, machine forge and wheel shops, yard and scale houses, turntables, coaling stations, terminals, train sheds, loading platforms, repair pits, etc.—*Bulletin of Edison Lamp Works* (L. D. 128, Index 71).

Illumination Values and Measurements.—A listing of the foot-candle intensities for almost every important industry, arranged in alphabetical order. The majority of the listed locations require an illumination within a range of from 3 foot-candles to 6 foot-candles or from 6 foot-candles to 12 foot-candles. The industries are arranged in another set of groups, in which those taking like numbers of foot-candles are all in one group. The method of making and recording illumination measurements is described so that it may be applied to any type of building. — *Bulletin E-101, Westinghouse Lamp Works.*

Reflectors for Incandescent Lamps.—A. B. ODAY and A. S. TURNER, JR.—A general discussion of the different types of reflectors and detailed data on each separate type. These data include a distribution curve for each type of reflector and a description of such characteristics as materials, shape, distribution, diffusion, glare and maintenance. The applications to which the reflectors are suitable are named under each type.—*Bulletin of Edison Lamp Works* (L. D. 123, Index 22).

Traction

Electric Traction Proposed for Eleven Railroads.—An estimate of the results which will be brought about on the railroads of the Northeast by the adoption of a superpower scheme. It is held that about 19,000 miles of railroad in this section could be electrified. This would cost nearly half a billion dollars, but it is estimated that it would pay from 11 to 19 per cent, or an average of 15 per cent, per year on the investment. The maintenance of the electric distribution system is taken at $600 per mile of train track and $400 per mile of yard track. The cost of operation and maintenance of substations is based on $1.50 per kilowatt per year of capacity, giving 0.7 mill per kilowatt-hour for a capacity factor of 25 per cent. Cost of the catenary system and electric equipment is recorded in this article in complete form in a table.—*Railway Electrical Engineer*, November, 1921.

High-Speed Monorail Traction System.—M. MAHL.—Between the twin cities of Barmen and Elberfeld in Germany there has been in successful operation for about twenty years a monorail overhead-trolley system traveling at the rather high average speed of 20 miles an hour. The author of the somewhat visionary paper under notice gives a very elaborate and detailed description of a similar monorail road, capable of traveling 200 miles an hour, and intended to connect Paris with Nice, a distance of 600 miles, to be traversed in three hours. Instead of using a solid girder construction to support the single running rail, Mr. Mahl has chosen a rail held by a catenary cable suspension system. There is one driving wheel provided for each meter's length of the vehicle. Each of these driving wheels has an inbuilt gearless 40-kw. motor weighing 550 kg. The complete car would weigh about 1,350 kg. per meter, or for a length of 50 m. about 65 tons, including passengers. To increase the adhesion of the wheels, a magnetizing winding is embedded in the outer part of the wheels. Steel towers, weighing each about 7,000 kg., are supposed to be erected every 50 m. on the level and every 30 m. on grades. Six steel cables, 45 mm. in diameter, support the rail. The entire supporting struc-

ture would weigh about 400 tons and cost about 500,000 francs per kilometer. The author suggests that a similar system could be used for hauling ships along the many navigable canals in France. In that case the monorail would be a cog rail, into which a pinion driven by a 10-hp. motor would mesh.—*Bulletin de la Société Française des Electriciens*, July, 1921.

Stimulating Freight Transportation on Street-Car Lines.—R. WOLFF.—The author suggests maintaining, besides the regular passenger service, a regular service of trolley cars for exclusive freight transportation. To each freight trolley car he would connect one or two storage-battery-driven trucks with pneumatic wheels, which would run from the end of the trolley line to the establishments of out-of-town customers. Figures are given to show the rentability of such a system.—*Elektrische Kraftbetriebe und Bahnen*, October, 1921.

Installations, Systems and Appliances

Locating Electrical Trouble on Elevators.—WILLIAM ZEPERNICK.—Definitions are given for grounds, short circuits and open circuits, and the proper methods of grounding power systems are described. The troubles which may develop in elevator control apparatus are explained and various methods of locating them are illustrated by examples. Troubles which may develop on the motors themselves are also discussed.—*Power*, Nov. 15, 1921.

Protection of Transmission Lines with Condensers.—GEORGE LEWIS.—Use of condensers for protecting transmission lines against high-voltage high-frequency potentials. This type of arrester, it is stated, is used commonly in Europe.—*Electrical Review*, Nov. 5, 1921.

Application of Electrical Energy in Lumber Mills.—W. A. SCOTT.—A description of motor application to various drives in the lumber mills of the Southwest. Sizes of motors and methods of connection to driven machines are given. Special requirements peculiar to the lumber industry and the use of mill refuse as a fuel to generate electric power are also discussed.—*Electrical Review*, Nov. 5, 1921.

Oil Switches for Voltages Up to 35,000.—S. TAUBE.—The author describes in minutest detail the mechanical and electrical construction of the latest types of B.B.C. oil switches, placing greatest stress upon the automatic opening device, clutch construction, magnetic and motor drive, signaling system and remote control. The short article contains twenty-seven illustrations.—*Brown-Boveri Mitteilungen*, November, 1921.

Electrochemistry and Batteries

Commercial Electrolysis of Zinc Sulphate Solutions.—SAMUEL FIELD.—Description of the deposition of compact yet detachable sheets of pure zinc from zinc sulphate solutions derived by the leaching of zinc ores with sulphuric acid. The kilowatt-hour consumption per ton of zinc deposited with various currents and compositions of liquors is tabulated.—*Transactions of Faraday Society*, Vol. XVI, Part 3, 1921.

Electroplating for the Prevention of Corrosion.—LESLIE AITCHISON.—A discussion of the protection of iron and steel against corrosion by covering the surface with a layer of some material which will perform two functions. The first function is that the layer must possess permanence in a high degree, and the second is that the layer must be one which will prevent any access to the metal of corrosive agents usually destructive.—*Transactions of Faraday Society*, Vol. XVI, Part 3, 1921.

Gray-Iron Castings from Electric Furnace.—THOMAS ROBSON HAY.—Present electric practice for making gray iron and some of its advantages over the older methods are recounted. The better qualities of the product and the ease of regulating temperatures are pointed out.—*Iron Age*, Nov. 10, 1921.

Electrophysics and Magnetism

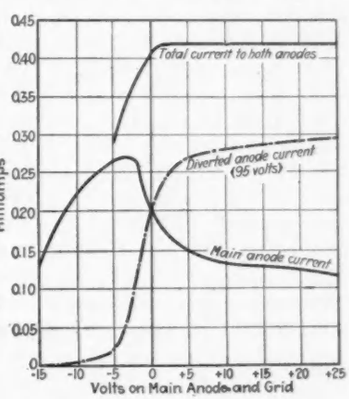
Advances in Production and Application of X-Rays.—J. S. SHEARER.—A discussion of the history and the principles of X-rays and their application to fluoroscopy and radiography. Their uses to discover flaws in metals and in the examination of crystals are two noteworthy applications in addition to the usual ones in the field of medicine.—*Journal of Franklin Institute*, November, 1921.

Magnetic Susceptibilities. — S. R. WILLIAMS. — An article treating first of the classification of magnetic substances into diamagnetic, paramagnetic and ferromagnetic. An attempt is made to locate the origin of the property of susceptibility.—*Science*, Oct. 14, 1921.

Telegraphy, Telephony and Signals

Development of Army Wireless During the War.—A. G. T. CUSINS.—A history showing the progress of developments in the wireless field, the evolution of service apparatus, the present trend and possible advance in this field.—*Journal of Institute of Electrical Engineers*, Vol. 59, No. 303.

Negative Resistance Device for Wireless Telegraphy.—JOHN SCOTT-TAGGART.—Two articles regarding the use in wireless telegraphy of devices having negative resistance characteristics. These devices are respectively the "negatron" and "biotron." The chief value of a negative resistance is that if it is connected in series with a positive resistance circuit, it will comparatively or completely neutralize the ordinary resistance of the circuit. This property enables signals of all kinds to be greatly amplified and is therefore of great value in radio telegraphy.—London *Engineering*, Oct. 21, 1921.



NEGATRON WHICH HAS A NEGATIVE RESISTANCE COEFFICIENT

Miscellaneous

Science of Electric Welding.—W. E. RUDER.—This article starts with a history of the art of electric welding carried through to the present development. A comparison between the carbon and the metallic electrode is made. The physical properties of welds are discussed, and a number of illustrations show micrographs of various welds and welding rods, telling what is good and what is bad. Methods of testing welds are also discussed. The article states that during 1920 the sum spent for arc-welding apparatus, exclusive of accessories and supplies, was $2,000,000, while the accessories and supplies cost $2,500,000. A discussion of welding generators and of automatic arc welding is included.—*Journal of Franklin Institute*, November, 1921.

Books of Technical and Industrial Interest

WASTE IN INDUSTRY. By the Committee on Elimination of Waste in Industry of the Federated American Engineering Societies. Washington, D. C.: Published by the Federated American Engineering Societies. Sole selling agents, McGraw-Hill Book Company, Inc., New York. 399 pages.

How can the American workman maintain a high standard of living and yet compete with cheap foreign labor? The socialist, the social worker, the political economist and others have proclaimed their respective plans, but it has remained for the engineer to get at the root of the thing, namely, to point out the giant evil that must be overcome and place the responsibility for its existence. Waste—unproductive, lost effort, money thrown to the four winds, in tremendous amounts—here lies the great obstructive factor in the problem, and to its reduction the serious thought of industrial leaders and labor leaders, and indeed of all good citizens, must be directed.

Herbert Hoover, when he became leader of the Federated American Engineering Societies, called for a study of the causes of industrial waste. An organization was quickly formed, plans were made, work was laid out, and a study of six typical branches of industry was started which continued for five months. These industries were: Building, men's clothing manufacturing, shoe manufacturing, printing, metal trades, and textile manufacturing. A few plants were chosen in each field for analysis, and from these reports the extent of the waste and the responsibility for it were evaluated. To management, it is shown, belongs the greatest responsibility because of its greater opportunity; to labor falls the next largest share, and to outside causes the remainder. There has been no attempt to make the report a complete handbook on how to detect and eliminate waste. It does, however, reveal a carefully thought-out method for searching out waste in any establishment. For those engaged in the particular industries studied the report, of course, has an added value, but its application is by no means limited to these industries. A number of very interesting situations are revealed. For instance, it is shown that the loss from strikes and lockouts is almost negligible, at least so far as labor is concerned. The loss, on the other hand, from illness is tremendous, as is also that from accidents. The lack of careful planning of production is evident. The volume concludes with general reports by specialists in each of the following topics: "Unemployment," "Strikes and Lockouts," "Legal Machinery for Adjusting Disputes," "Industrial Accidents," "Health of Industrial Workers," "Eye Conservation," "Purchasing and Sales Policies."

To factory executives this report is recommended (1) as a means for understanding the enormity of industrial waste and (2) as a means for studying individual plants. The work of the committee might be profitably supplemented by a more detailed analysis of the engineering conditions and a fuller interpretation of the data supporting the conclusions drawn.

WECHSELSTROM-LEISTUNGS-MESSUNGEN. By Werner Skirl. 278 pages, 215 illustrations. Berlin: Julius Springer.

In extended networks it is frequently necessary to make electrical measurements of various characters in the field rather than in the laboratory. Such measurements will therefore be made in many cases by men less skilled and experienced in the proper use of methods and instruments than the regular laboratory force. For these less experienced men this book is written. Not only is the method best suited for each particular case given, with necessary wiring diagrams, but also a full description of the instruments used and directions for their proper care will be found in this book. Special attention has been given to all high-voltage measurements and to the proper use of potential and current transformers. The use of these transformers is urged also for low-voltage lines, and very reliable so-called semi-indirect methods are described where the transformer is used in a manner similar to a shunt in direct-current practice. Of special interest will be found the section on calibrating methods used for wattmeters and watt-hour meters. In its arrangement the book is primarily a reference book, giving ready and exhaustive information on all matters pertaining to alternating-current measurements and methods.

DIE PORZELLAN ISOLATOREN. By Prof. G. Benischke. Berlin: Julius Springer. 94 pages, 128 illustrations.

It is impossible in a book of such small compass as this to treat the entire subject of electric porcelain insulators in a way to satisfy fully both the ceramic manufacturer and the electrical engineer. The author has, therefore, confined himself to a rough and very short outline of the manufacture of insulators and deals at length with their electric properties, types and testing. The book contains nothing new to the experienced high-voltage engineer, but contains, well described and illustrated, all necessary data on its diversified subject.

A. S. T. M. STANDARDS. Philadelphia: American Society of Testing Materials. 890 pages.

The 1921 edition of this volume, which is issued triennially, contains 160 standards as follows: Sixty-one relating to steel and wrought iron, thirty-one to non-ferrous metals, nineteen to road materials, eighteen to cement, lime, gypsum and clay products, ten to preservative coatings and lubricants, seven to pig and cast iron and finished castings, six to timber and timber preservatives, four to coke and coal, two to rubber and two to miscellaneous. These standards are recognized as authoritative in the field of engineering materials.

Books Received

COIL IGNITION FOR MOTOR CARS. By C. Sylvester. London: Sir Isaac Pitman & Son, Ltd. 224 pages, 221 illustrations.

THE ELECTRICAL TRANSMISSION OF PHOTOGRAPHS. By Marcus J. Martin. London: Sir Isaac Pitman & Sons, Ltd. 134 pages, 132 illustrations.

ELECTRICAL TRANSMISSION OF ENERGY. By W. M. Thornton. London: Sir Isaac Pitman & Sons, Ltd. 113 pages, 49 illustrations.

THE ELECTRIC FURNACE. By J. N. Pring. London: Longmans, Green & Company. 483 pages, 426 illustrations.

SWITZERLAND: A COMMERCIAL AND INDUSTRIAL HANDBOOK. By H. Lawrence Groves. Washington: Government Printing Office. 128 pages, 13 illustrations.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Adjusting Government Undertakings to Business Needs

IN ORDER that the federal government may be in a better position to adjust the volume of public works undertaken by it to conform with the needs of business Senator Kenyon of Iowa has introduced a bill granting additional authority in this regard to the executive departments and authorizing the collection of additional statistics. Hearings on the bill have been set to begin Dec. 2.

Government to Make Legal Powers of Trade Associations Clear

FUNCTIONS and activities that trade associations may legally engage in will soon be announced by the government, E. W. McCullough, manager of the fabricated production department of the Chamber of Commence of the United States, told the American Face Brick Association at its annual convention, held on Dec. 2 at White Sulphur Springs, W. Va. He said that such a statement would have been issued before this but for the fact that several governmental cases are now pending against certain trade associations, involving such questions as the proper use of statistics, open price plans and averages in cost accounting.

According to Mr. McCullough, Secretary Hoover of the Department of Commerce desires closer contact with the industries through their associations, but Secretary Hoover has intimated that such organizations should put themselves in position to speak for their industries by including in their membership the largest possible representation, and also through the perfection of their machinery for gathering, analyzing and compiling all desirable information of service not only to themselves but to the government and the public.

Patent Office Conditions Become Still Worse

WHEN Commissioner Newton was in charge of the Patent Office in July, 1919, he testified before a committee of Congress to the effect that the situation in his bureau was deplorable and worse than at any time since he joined the service in 1891. The present Commissioner of Patents asserts in his report to Congress that conditions have grown steadily worse since the testimony of Commissioner Newton. Between July, 1919, and June 30, 1921, the Patent Office lost 163 of its examiners. "These men," says the Commissioner in his report, "were scientifically trained and also members of the bar. They have been replaced by inexperienced men, fresh from college, without any knowledge of patent law and without legal training." Continuing, the report says in part:

"The number of applications for patents increased 34 per cent during the period under discussion, while the trademark applications increased 85 per cent. In July, 1919, when Commissioner Newton testified, there were 18,000 patent applications awaiting action. There are now about 50,000. A number of divisions are over eleven months behind in their work. One out of every four examiners has resigned in sixteen months and more than one-half have resigned in thirty-two months. Relief is, therefore, indicated as imperative."

The assistant examiners, who are a highly educated and picked corps of scientific men, receive the same initial salary as clerks who perform routine duties in other branches of the government service. Note is made in the report of the inadequacy of the salaries paid to these technical men, which has made it impossible to retain them.

It is shown that there are many industries which cannot enter into development work on account of the doubtful status of their applications for patents. A bill is now pending in the House which is designed as an emergency measure to help relieve the situation.

Electric Utilities Have Average Coal Stocks Sufficient for Fifty-four Days

AN INVENTORY of coal stocks as of Nov. 1 taken jointly by the Department of Commerce and the Geological Survey shows that there was at that date a total of about 47,400,000 tons of coal in the hands of consumers, or approximately forty-three days' supply. This compares with stocks as high as 63,000,000 tons in the past. Electric public utilities were credited with an average supply sufficient for fifty-four days. The next inventory will be as of Jan. 1.

New Company to Develop Northern Indiana Water Powers

PLANS of the Indiana Hydro-Electric Power Company for the establishment of five large hydro-electric power plants along the Tippecanoe River in northern Indiana have been made public following the filing of a petition with the Public Service Commission asking authority to issue $1,250,000 in gold bonds and $4,500,000 of common stock. Of this stock $1,125,000 is to be placed on the market at once. The capital of the company is to be $5,000,000. Announcement of the completion of the plans marks the realization of a project that has been under consideration for many years.

The first power plant and dam of the company is to be erected at Norway, in White County, 2½ miles north of Monticello. When completed the plant will be operated by the Interstate Public Service Company, one of the largest electric operating companies of Indiana. Power developed after the needs of the Interstate company are met will be sold to other utility companies and the public. Through the construction of additional transmission lines, which are to connect with the Insull electric properties, all the power that is needed by many local plants will be available.

Incorporators of the new company are Harry Reid,

Ira E. Guthrie and John A. Shafer. Samuel Insull of Chicago, president of Middle West Utilities Company, will be a director. Mr. Reid, who is president of the Interstate Public Service Company, will be vice-president and general manager of the new company. In addition to the Insull interests it is understood that Eastern capitalists are back of the project.

The five proposed units of the new company will have an aggregate installed capacity of more than 20,000 kw. The first unit at Norway, where construction work is to begin at once, will have a capacity of 6,500 kw. and will be capable of generating 25,000,000 kw.-hr. annually. The new company will take over all of the property of the Tippecanoe Hydraulic Company, which was organized a number of years ago. Approximately $300.-000 has already been expended in the acquisition of land, right-of-way and flowage rights.

Dayton Company to Lower Industrial Rates Voluntarily

EFFECTIVE Jan. 1, 1922, surcharges of 35 per cent against commercial light and power consumers supplied by the Dayton Power & Light Company of Dayton, Ohio, will be reduced to 25 per cent. This will make a net reduction of approximately 7½ per cent in the amount of the monthly bills to this class of consumers, company officials say. The reduction, which is voluntary on the part of the company, will not affect domestic rates, it is said.

The surcharges were placed in effect when increases in rates due to higher operating costs were made necessary. Prior to that time a blanket rate applied. Instead of changing this blanket rate, a system of surcharges for the different classes of service was instituted. The decision to lower the commercial rates, officials said, was based upon the expectation that coal prices will be lower after April 1, 1922, when new fuel contracts are to be made by the company.

Electrical Commercial Men to Meet in New Orleans in January

A SOUTHERN midwinter meeting of commercial electrical men has been arranged by the Electrical League of New Orleans to be held at the Grunewald Hotel, Jan. 17-20. The basis for this gathering will be the meeting of the bureaus and committees of the Commercial Section of the National Electric Light Association. The wiring committee of the N. E. L. A. is to meet on the seventeenth, the bureaus and committees of the Commercial Section on the next two days and the sections executive committee the twentieth.

Coincidentally with these meetings it is expected that there will be held meetings of the executive committee of the Southwestern Geographic Division, N. E. L. A., and also of the commercial men of the division and of the South generally, Louisiana and Mississippi members of the National Association of Electrical Contractors and Dealers, the Dixie Club, which is the Southern jobbers' association, and the Conference Club. Arrangements include the large general meeting for all to discuss broad questions of timely interest to the industry.

The local committee in charge of the meeting is composed of Robley S. Stearns, chairman; W. E. Clement, Lyman C. Reed, C. S. Barnes and Frank H. Ames.

Arrangements are being made also for a stop-off at Atlanta for the wiring committee and any others interested to see an exhibition of changing insulators on live high-tension lines of the Georgia Railway & Power Company.

Chamber of Commerce Studying Distribution Problems in the Field

IN ITS investigation of the varied problems affecting distribution of goods the committee of the domestic distribution department of the Chamber of Commerce of the United States will hold a series of open hearings in different parts of the country so as to learn by intimate contact with distributers what their problems are. More effective distribution methods are the ultimate goal of the committee. The first of the hearings has just been held by the committee at Kansas City and developed helpful information as to distribution problems of the Middle West which the committee will be able to use in its study of the whole question of distribution. Three important distribution questions were dealt with—"Problem of Keeping Up Sales," "Re-establishment of Confidence in Prices" and "Elimination of Waste in Distributive Processes."

Milwaukee Electrical Interests Combine to Promote Better Lighting

VARIOUS electrical interests of Milwaukee, including illuminating engineers, contractors and dealers, manufacturers and jobbers, the local electric light and power company and the Chandelier Club, have combined to promote better lighting in the city and throughout the state. The work is being carried on under the auspices of the Electrical Development Association of Wisconsin, which has established an office in the First Wisconsin National Bank Building, where all questions relating to the wiring of buildings and electrical illumination will be answered without charge by experts. The association will not take contracts or sell fixtures, but will furnish approximate estimates on both as part of its free service. Its main purposes, however, are the dissemination of a knowledge of the latest developments in lighting among those connected with the electrical industry, the education of business men and the public at large in the value and economy of good lighting in factory, store, office and home, and the support of the movement by actual demonstrations.

R. M. Van Vleet is the president of the Electrical Development Association of Wisconsin, and F. A. Coffin is the secretary. Mr. Coffin, J. C. Schmidtbauer and Arthur Polacheck compose the publicity committee.

New Mexico Companies Plan Local Efforts to Sell Stock

MEETING at El Paso, Tex., last month, the executive committee of the New Mexico Electrical Association fixed Feb. 13 and 14, 1922, as the date for the annual convention of the association, to be held at Albuquerque, N. M. Full co-operation with the Rocky Mountain Geographic Division of the N. E. L. A. was pledged, and especially with the new public utility information committee. There was a discussion on the customer ownership of stock, and a few companies reported that they were planning to sell stock to their patrons.

Arthur Prager is president and Charles E. Twogood secretary-treasurer of the New Mexico Electrical Association.

Federal Reserve Board Sounds Optimistic Note in Business Survey

A SURVEY of the general business and financial conditions throughout the country made public a week ago by the Federal Reserve Board indicates that steady progress back to normal conditions may be expected, although no sudden expansion or "boom" is in sight. The investigators for the board in all of the Federal Reserve districts are convinced that the worst conditions have been faced, and that the unemployment situation is somewhat relieved.

Although improvement in business conditions was not quite so pronounced in November as in the preceding two months, the progress toward normal conditions has been continuous, as may be seen by a comparison with the corresponding month of a year ago. Another hopeful sign is found in the fact that export trade has continued in substantial volume, showing an increase in October and indicating a strong foreign demand, especially in staples.

"Carrier Current" for Interstation Communication Demonstrated

APPLICATION of the "carrier-current" system of telephony as a means of more effective communication between generating stations and distribution centers was demonstrated for the first time at the plant of the General Electric Company, Schenectady, N. Y., on Dec. 7 before a group of about twenty-five central-station company executives, engineers and radio men. Communication was effected between the power house in the General Electric plant and the hydro-electric station of the Adirondack Power & Light Corporation at Schaghticoke, N. Y., 38 miles distant. Conversation between these points was carried on freely in both directions. In many respects the tests were similar to those of last week on the Schenectady Railway Company as reported in the ELECTRICAL WORLD; but in this instance the superimposed or "carrier" current was impressed on the high-voltage transmission line instead of the trolley wire.

The apparatus used for the demonstration, which was developed by the radio department, utilizes the normal power supply available at the station and consists of a double-current generator directly connected to a 110-volt motor, either alternating current or direct current, equipped with suitable starting and control apparatus. The motor-generator set produces current at audio frequencies, but higher than normal voice frequencies. The current is transferred to the transmission line by a capacity coupler.

Among the advantages claimed for the new system as determined by the tests are that the energy required is virtually negligible as it is guided by the transmission lines instead of being radiated in all directions through the ether as in wireless telephony. The system has proved itself free from inductive interference and atmospheric disturbances such as static, and it does not of itself produce inductive interference to a degree that would cause disturbances in other communicating systems. No elaborate antennas are required. Finally, the system will function satisfactorily even if a considerable gap exists in the transmission line. Through the use of the system communication is made possible between the load dispatcher at the distribution center and any or all of the generating stations on the line, and between the generating stations and all power houses for the interchange of instructions having to do with proper operation of the whole system.

Underwriters' Code to Be Enlarged to Cover Safety to Persons

A MOTION to develop the National Electrical Code to cover both safety to persons and fire hazards was passed at the meeting of the electrical committee of the National Fire Protective Association held in New York Dec. 5 and 6. Another action of great interest was the formation of a committee to pass upon distinctly new forms of equipment not covered by the present rules with a view to recommending trial installations, where the local authorities are willing, without waiting until a new code is issued. Plans for future committee work on code revision were also discussed.

A long discussion was held on the relation of the National Electrical Code to general safety requirements. The result was the vote to instruct the standing committee that it should consider safety to persons as well as safety from fire hazards in its future development of the code. By thus increasing the phase of safety devoted to protection of persons it is planned to make this code eventually cover completely both phases.

The "committee on new developments" was organized for the purpose of receiving and considering new devices, materials, systems and methods for which there is no provision in the existing code. After investigation, the committee will, if it desires, recommend the new product for introduction in trial installations for the purpose of field experience. The committee will not deal with products which involve only changes in the existing rules.

The primary purpose of the committee meeting held last Monday and Tuesday was to discuss plans for the committee work upon the next edition of the code. The ten standing committees will report to the main committee in November, 1922, after which a bulletin will be issued announcing the proposed changes. The final public hearing will be held in March, 1923, and as soon as possible thereafter a new edition will be published.

There was considerable further discussion on the rule limiting the amount of energy to be supplied from one lighting circuit, as well as on grounding rules, motion-picture machines and lamps, extensions to wiring in fireproof buildings, equipment in dusty places and wireless rules. It was voted to omit entirely the rules on marine installation.

Higher Prices for Utility Bonds

THIS week was another large week in electric light and power company financing, and prices were higher than they have been. An issue of $12,500,000 first lien and refunding gold bonds, 6 per cent series, due 1941, of the Philadelphia Electric Company was quickly over-subscribed at 99, which gave a 6.05 per cent yield. The issue was later quoted at a premium.

The Penn Public Service Corporation's $750,000 first and refunding mortgage gold bonds, 6 per cent, ten-year, series A, came out at 96, which is on a 6.7 per cent basis.

A new issue of $1,500,000 twenty-year, 7 per cent gold notes was marketed at par. Some other large issues are expected to come out before the holidays.

Harding Would Prevent Issuance of Non-Taxable Securities

AMONG the high spots in the address of President Harding at the opening of Congress on Tuesday of this week was the recommendation that Congress consider an amendment to the Constitution which would prevent the further issuance of non-taxable securities. This is a matter the public utilities have been urging for some time because of the difficulty that business organizations have in financing when governmental agencies are able to offer payers of high income surtaxes securities free from taxation.

Among the other outstanding points in the President's message were those relating to the tariff. He advocated a law providing that urgent changes in the tariff shall be made by proclamation of the President on the recommendation of the Tariff Commission. He also favored an early completion of the tariff bill and that the President receive authority to fix tariff duties with the assistance of the commission. He recommended the "American valuation plan" as a means for offsetting the inequalities in exchange rates that now prevail.

The President also suggested a national industrial relations court to regulate labor disputes.

Vehicle Men Are Told That Electric Trucks Are Not Being Properly Sold

THE future of the electric truck, the past twenty years' developments in such vehicles, and the nature of work which the National Electric Light Association is doing to increase the use of "electrics" were the subjects of three addresses presented before a meeting of transportation engineers and automobile dealers in New York on Dec. 2. The meeting was held under the auspices of the automobile bureau of the New York Edison Company, the discussions being contributed by James H. McGraw, president of the McGraw-Hill Company, Inc.; Henry S. Baldwin, General Electric Company, and A. Jackson Marshall, of the National Electric Light Association.

In the unavoidable absence of Mr. McGraw his views were presented by W. H. Onken, Jr., editor of the ELECTRICAL WORLD. "For package delivery the horse will quickly disappear from our streets and the gasoline truck will have to fight hard to maintain its existence," he declared. "Of all motor-driven trucks, those electrically driven have proved themselves best suited in every respect to supersede horse traction in city delivery service. The speed of the 'electric' is double or triple that of horses with equal loads. It is self-starting and is easily controlled. The vehicle has a short wheel base so that it takes up less space than any other vehicle on the public highways and in garages. It is clean, sanitary and has no fire risks. Operating within a radius of 10 miles, which embraces most of the trucking of department stores, express companies and others, with frequent stopping and starting, the electric vehicle is supreme.

"The question naturally arises, 'Why are not more electric trucks used?' Is it because they are inefficient? No! Tests show them to be more efficient than the horse-drawn or gasoline-driven truck. Is it because they do not give satisfaction? No! Experience shows that the greatest purchasers of electric trucks are those who already have them in operation. Is it because of excessive repairs and upkeep? Most assuredly not, for it is just in low upkeep and insignificant repairs that the electric vehicles excel all others. Are they unreliable? Hardly, since the most conservative business organizations in the city, including the express companies and others to whom reliability of transportation is of vital importance, are the greatest users of 'electrics.' Are they intricate? Quite the contrary; they are so simple that a child can operate them. Are they more expensive? Not exactly; for while the first cost may be higher, the ultimate cost, taking into consideration the life and upkeep of the truck, is less than that of the gasoline truck.

"Why then are not more of them used? Because they are not being properly sold."

Mr. Baldwin covered the development of the electric truck during the last twenty years in a masterly and thorough manner that left very little to be said on the subject. In doing so he considered virtually every part that makes up such a vehicle.

Jobbers See Need for Greater Effort in Construction Field by Contractors

PARTICULAR attention to the prospect of steadily growing activity in wiring construction and the need for guiding and stimulating the electrical contractor-dealer to greater effort to develop this side of his business as well as the sale of appliances was given at the midwinter convention of the Electrical Supply Jobbers' Association, held in Cleveland, at the Hotel Cleveland, from Nov. 28 to Dec. 2. The meeting was well attended and productive of spirited discussion and wide interest.

The opening day was given up to work of the executive committee. On Tuesday morning there was a meeting of the Atlantic Division with an address by W. L. Goodwin, assistant to the president of the Society for Electrical Development, in which he presented the plans and purposes of that society and discussed broadly conditions in the industry, explaining how the society is endeavoring to function for the closer co-ordination of the different groups of electrical men. The first open session of all divisions was held on Wednesday morning, with Frank E. Watts, assistant to the president of the Gage Publishing Company, and James R. Strong, president National Association of Electrical Contractors and Dealers, as speakers.

Under the title "The Electrical Contractor-Dealer as a Construction Man and a Merchant," Mr. Watts sounded a warning against the neglect of the wiring business by contractor-dealers who during the reconstruction period, while construction work has been scarce, have devoted their attention mainly to appliance selling. With the increase in building operations, he said, more thought should be given to developing the contractor as a construction man.

Mr. Strong was on the program to discuss "Electraging for Electragists" and explained the reason why these new terms have been indorsed and adopted by the contractor association, following this with a free discussion of Mr. Watts' recommendations. His organization, he said, is encouraging construction work in every way and working for the properly balanced development of the trade, and particularly for the proper keeping of cost data.

A general discussion of both addresses ensued, in

which the sense of the meeting was that the development of the contractor is a natural process of evolution and cannot be controlled, but that the influence of the jobber should clearly be thrown toward the selective influencing of the contractor-dealer to follow the work for which he is individually best fitted. The prospects for construction work are increasingly good, but the stimulation of construction need not carry with it any curtailment of profitable appliance selling.

Thursday afternoon's open session was addressed by W. W. Freeman, president Union Gas & Electric Company, Cincinnati, and also president of the Society for Electrical Development, and by F. M. Feiker, assistant to the Secretary of Commerce and vice-president of the McGraw-Hill Company. Mr. Freeman spoke on "The Merchandising of Electrical Appliances" and delivered a message of hope and confidence. Without extending lines to another customer, he said, $10,000,000 worth of electrical appliances and supplies can be sold in Cincinnati before the market is saturated. This opportunity is tremendous, and though electrical men cannot expect to get together on all policies, they should combine in the support of the many policies on which they can agree.

Mr. Feiker, in discussing "The Electrical Industry," described the reorganization of the Department of Commerce, in which he is assisting Secretary Hoover, and gave some most interesting facts concerning the practical work which is being done for the elimination of waste in industry. He stressed the great need for better standardization in electrical manufactures. The Bureau of Standards, he said, is being simplified and readjusted to render a service of prophecy rather than of history.

Executive sessions were held on Wednesday, Thursday and Friday and were devoted mainly to discussing the progress which has been made in the study of the jobbers' cost of doing business, the probable influence of the non-electric store as an element in the distribution of electrical goods, and measures for increasing the creative influence of the jobbers. It was decided that the association's publicity campaign would not be continued next year. The next convention will be held at Hot Springs, Va., in May.

Boston Edison Company Restores Service to Over 35,000 Customers in Nine Days

SEVENTY-FIVE per cent of the customers of the Edison Electric Illuminating Company of Boston who lost their service during the great New England sleet storm of Nov. 27-28 were receiving energy from the system by the night of Dec. 4. To a representative of the ELECTRICAL WORLD President C. L. Edgar said on Monday that by Wednesday night it was expected that 97 per cent of the 35,000 to 40,000 customers who were cut off by the storm would be getting service again. Many of these are in suburban territory. Local difficulties, especially in remote rural districts, cannot, however, be overcome to give 100 per cent service to the remaining 3 per cent of the cut-off customers for one week to four weeks more. It is estimated that the total loss of the company in line equipment will reach in the neighborhood of $150,000 in its 700 sq. miles of territory. About 150 poles were down as a result of the storm.

W. H. Atkins, general superintendent of the company, stated Monday that about 200 extra linemen are at

SOME OF THE EFFECTS OF THE SLEET STORM IN NEW ENGLAND

work on the system and that the public has shown a remarkable appreciation of the situation. Boards of trade, newspaper editors and many individuals have pledged their support in the accident prevention efforts the company has been making and have voiced their realization that the interruption to service was beyond any previous one in New England utility history. Last Sunday cautions against touching loose wires were given in the Greater Boston churches through the company's suggestion. Officers and employees generally are working with might and main toward restoring service, but no night work is permitted on the lines.

No Recommendation Made on Depreciation to Federal Power Commission

THE statement published last week to the effect that O. C. Merrill, executive secretary of the Federal Power Commission, had recommended the acceptance of the changes proposed by the National Electric Light Association in the regulations dealing with depreciation was an error. Owing to a misunderstanding, our Washington office, which solicited the statement, believed it had reference to the recent hearing, whereas Mr. Merrill's brief dealt with a previous hearing before the Federal Power Commission. Mr. Merrill, who is now en route to the Pacific Coast, sends us the following communication from Chicago, dealing with the matter:

I have just had called to my attention the statement on page 1140 of the ELECTRICAL WORLD of Dec. 3 which quotes me as recommending for approval the acceptance of the proposed changes in the regulations of the Federal Power Commission with respect to depreciation which were recently suggested by the National Electric Light Association.

There has evidently been a misunderstanding with respect to the material which you have quoted. That material was part of a memorandum addressed to the Federal Power Commission concerning proposed amendments to the regulations which were submitted to the commission last May as a result of conferences held with the water-power development committee of the National Electric Light Association and has no reference to the present situation, in which the National Electric Light Association, notwithstanding the agreement reached with its committee after two weeks of conference last spring, now requests amendments in addition to those which were at that time, with one exception (the multiple in regulation 17), jointly approved by the committee and by the staff of the commission and were adopted by the commission in Orders No. 11 of June 6.

There has been a difference of viewpoint between certain members of the National Electric Light Association and the staff of the commission both with respect to the fundamental basis upon which depreciation should be computed and to the practical application of that basis. In the discussions last spring it became apparent that, whatever basis might be adopted by the commission, difficulty would be bound to arise if the method of accounting for depreciation on properties under government license differed from the method employed on the remainder of the property in the same physical system; and that this situation would exist if the Federal Power Commmission had one rule for one part of the property and the state had another rule for another part of the property. To obviate this difficulty the regulation as then existing was amended so that in all cases where licensees of the commission were public utilities subject to rate regulation by their respective states they would be permitted to follow the depreciation requirements of the state with respect to all their properties, would so report to the commission, and would not be required to follow any rule which the commission might adopt for licensees wholly under its jurisdiction, the commission merely reserving the right to make inquiries and issue appropriate orders in individual cases if it should be apparent that a licensee is not maintaining for the properties covered by his license depreciation reserves adequate for the purposes of the federal water-power act.

The general rule for accounting for depreciation as now contained in Regulation 16 applies, therefore, only to two classes of licensees: (1) those operating in states which have no commission or other similar authority with powers of rate regulation, and (2) those in other states not engaged in public utility service. For the first class the act specifically confers general power of regulation upon the commission; for the second class there is no agency other than the commission with any authority to determine what are adequate depreciation requirements. It has accordingly been necessary for the commission to establish some rule of depreciation to be applicable to these two classes of licensees.

In preparing such rule it has been the purpose to follow what appears to be the best established practice. The rule adopted is the same as that employed by the Interstate Commerce Commission for railroad properties, by the Internal Revenue Bureau in allowing deductions to determine taxable income, and by a considerable number of leading state commissions. There is the possibility that the application of the rule in the existing regulation is too rigid, and the National Electric Light Association has been requested to submit proposals for the application of the general principle in such a way that due consideration may be given both to the financial structure of the licensee and to the desirability of maintaining its capital assets unimpaired. Meantime those questions are being taken up with some of the state commmissions, and it is hoped that early in the year it may be possible for the commission's staff to make its recommendations to the commission. We have never been unwilling to consider any constructive suggestions, whatever modifications of existing regulations might be involved, if it could be shown that such suggestions have a sound economic basis and conform to the requirements of the federal water-power act.

Out of the 17,000,000 hp. involved in applications before the commission, over 96 per cent involves public utility service in states which have agencies for rate regulation, and less than 4 per cent would be subject to any rule for depreciation which the commission might adopt. It should be perfectly apparent, therefore, regardless of the opinion which may be held with respect to the rule for depreciation now contained in the commission's regulations, that it can have no appreciable effect in hindering, as some have claimed, the development of water power under the federal water-power act. Projects involving an ultimate installation of 1,276,000 hp. are already being constructed under license from the commission, an amount greater than has ever hitherto been undertaken under federal authorization. Still more will be started when the general economic conditions which are hindering all development are improved.

The federal water-power act requires that licensees "shall maintain the project works in a condition of repair adequate . . . for the efficient operation of said works in the development and transmission of power," and many of those who oppose the existing regulation read nothing else in the act. The same section and paragraph require the maintenance of reserves adequate for making all necessary renewals and replacements, and what are necessary replacements and what are adequate reserves cannot be determined wholly upon the language of a single, isolated paragraph, but must also be viewed in the light of the act as a whole, for Section 10, paragraph (c), is by no means the only place where depreciation reserves are considered. The fundamental principle underlying the whole structure of the act is the maintenance, unimpaired, of the capital invested in the project. The necessary renewals and replacements can be assured and the integrity of the investment maintained only when the reserves represent within reasonable limits the depreciation in value which the properties necessarily undergo in service. This should be a matter of common prudence on the part of the licensee himself, for the Supreme Court has said that no one can be expected to see his properties waste away, as they inevitably must, in the public service without having such current losses replaced through current earnings.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Radio in the Aviation Service.—The Army Air Service has approved plans for a country-wide series of radio stations intended to permit constant communication with aviators. Among other things, it is expected to reduce the hazard of flying by making possible the dissemination of storm warnings.

Appalachian Power Company to Enlarge Capacity.—The Appalachian Power Company of Bluefield, W. Va., has begun construction of an addition to its steam plant at Glen Lyn, Va. The present capacity of this plant is 25,000 kw., and the addition, which is expected to be completed about June 1, 1922, will bring it up to 38,750 kw.

Architects and Electricity.—The New Orleans Electrical League entertained the members of the New Orleans Chapter of the Louisiana Architects' Association at dinner recently, and John A. Corcoran, New York, publicity manager for the General Electric Company, gave an illustrated address designed in part to dissipate the idea that the electrical contractor and the architect cannot co-operate. The architect must interest himself in electricity, Mr. Corcoran declared. His clients need it, and it is the one mechanical art that the architect must study. Contractors and dealers look to the architect to set a standard.

Electricity at the Lyons Fair.—The activity in hydro-electrical development now prevailing in France lent especial importance to the electrical exhibits at the famous Lyons fair. These were on a large scale and included a transformer with a possible maximum rating of 350,000 volts. The cheapness of hydro-electricity has created a vast industry in domestic electrical appliances, and its employment in industrial establishments is spreading rapidly, although the Paris correspondent of the London *Engineer* notes a drawback in the heavy initial expense incurred through the practice of putting in reserve suction-gas plants. These are held to be made necessary by the possible service interruptions due to drought, frost or accident to the turbine.

Santa Barbara Electric Company Absorbed by Southern California.—Authority has been given by the California Railroad Commission to the Southern California Edison Company to acquire all the properties of the Santa Barbara Electric Company. The Southern California Edison Company is to pay $682,634.50 for the properties and to assume the payment of all the indebtedness and liabilities of the Santa Barbara company. The indebtedness to be assumed amounts to $1,056,863 80. The Edison company owns already all but 635 shares, face value $63,500, of the outstanding stock of the Santa Barbara company and has offered to purchase these 635 shares at $70.50 a share. The company urged that its offer to the minority stockholders was fair for the reason that the price of $70.50 is based upon a 6 per cent dividend while the Santa Barbara company has been paying only a 4 per cent dividend. The $682,634.50 is the equivalent of the $400,000 of outstanding preferred stock at par and the $400,900 of common stock at the rate of $70.50 a share.

London to Extend Its Underground Electric Railway Service.—Government aid is being sought by the London Underground Railways in carrying out improvements and extensions that have been under contemplation for several years. It is proposed to raise £6,000,000 new capital, and, in view especially of the fact that the work would provide 20,000 men with employment, as well as the urgent need for the new extensions, the government is asked to guarantee the interest on the securities.

Preaching by Radio.—Non-sectarian sermons and hymns delivered and sung in a private New York City residence before a score of persons were broadcasted on a recent Sunday to a "congregation" estimated at between 25,000 and 150,000 in hospitals and public homes and on shipboard. This service was the first of a series to be given weekly by the "Radio Church of America," which are expected to be welcome incidents in the lives of the ill and of others forced to remain indoors or away from shore.

Expert Advises Buffalo Against City Electric Plant.—F. W. Ballard, a consulting electrical engineer of Cleveland, who was formerly Commissioner of Light and Heat for that city, has reported to the Buffalo city authorities adversely on the question of establishing a municipal electric lighting plant at this time. He asserts that the city could not compete with the Buffalo General Electric Company in the sale of electricity for lighting purposes on account of the superior load factor that the company derives from its industrial business; that a plant on a scale large enough to compete with the central-station company in the sale of lighting and power would necessitate a bond issue of $20,000,000, and that even were such a plant built it would not, in his opinion, be possible to reduce rates below those now existing.

Electricity in Modern Vaults.—In the great steel vaults of the National City Building, New York City—formerly the Hotel Manhattan and, like the Knickerbocker Building, another recently converted hotel, now supplied throughout with central-station service—electricity performs a function of unique character. The two-story vaults have, the *Edison Monthly* explains, entrances from the basement and the sub-basement. They are so placed with respect to the floors that the great circular time-clock doors cannot be opened without shifting of the floor sections immediately in front. These floor sections are shaped like a half circle and are about ten feet wide. With the beginning of the day's business, the interior of the vaults must be readily accessible. Switches connecting with small motors are thrown in, and the floorings are lowered to a new level. The vault doors are then swung open, and the motors elevate the floorings to their natural positions. This function is reversed at the close of banking hours. There are 14,000 safe-deposit boxes in the vault.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Pittsburgh Section, A. I. and S. E. E.—This section will, at its regular monthly meeting on Dec. 19, have a celebration of the fifteenth anniversary of the Association of Iron and Steel Electrical Engineers.

Massachusetts State Association of Electrical Contractors and Dealers.—This association will hold its annual meeting and banquet at the Hotel Kimball, Springfield, Mass., on Jan. 5, the business meeting to be held at 2 p.m. and the banquet at 6 p.m.

Radio Club of America.—This club met at Columbia University, New York, on Monday evening, Nov. 28, when L. C. F. Horle, consulting engineer of New York, read a paper on modulation methods with particular attention to their use in amateur radio telephony.

Philadelphia Section, I. E. S.—This section of the Illuminating Engineering Society will meet jointly with the Philadelphia Safety Council on Tuesday, Dec. 13. S. G. Hibben of the Westinghouse Lamp Works will discuss "Safety Factors of Industrial Lighting."

A. I. E. E. Section Meetings.—Section Institute meetings scheduled for next week are: Dec. 12, Philadelphia, "The Steel Tank Rectifier," by J. H. Milliken, Midstates Engineering Company, Chicago; Dec. 15, Hartford (Connecticut Section), "Caribou Hydro-Electric Development of the Great Western Power Company," by Albert A. Northrop of Stone & Webster; Dec. 16, Chicago, "Application of Electric Power to Iron and Steel Industry," by W. S. Hall, Illinois Steel Company. The New York Section meeting in conjunction with the A. S. M. E. announced for Dec. 14 has been canceled.

Coming Meetings of Electrical and Other Technical Societies

A. I. E. E. Section Meetings—Philadelphia Dec. 12; Hartford (Connecticut Section), Dec. 15; Chicago, Dec. 16.

A. I. and S. E. E.—Cleveland Section, Dec. 12; Chicago Section, Dec. 16; Pittsburgh Section, Dec. 19; Philadelphia Section, Dec. 20.

American Physical Society—Toronto, Dec. 27-30.

American Association for the Advancement of Science—Toronto, Dec. 27-31.

Massachusetts State Association of Electrical Contractors and Dealers—Springfield, Jan. 5.

American Engineering Council—Washington, Jan. 5-6.

Western Association of Electrical Inspectors—Chicago, Jan. 17-19.

American Society of Civil Engineers—New York, Jan. 18-19.

Association of Municipal Electrical Utilities of Ontario—Toronto, Jan. 26-27.

Lighting Fixture Dealers' Society of America—Milwaukee, Jan. 30-Feb. 2.

New Mexico Electrical Association—Albuquerque, Feb. 13-14.

American Institute of Electrical Engineers—Midwinter convention, New York City, Feb. 15-17.

National Meter Committee, N. E. L. A.—Springfield, Ill., Feb. 15.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Rating of Motors Versus Power Consumed.—A lease requiring the lessee to pay for electrical energy in excess of 8 hp. has been declared by the St. Louis Court of Appeals (Eisenstadt Manufacturing Company vs. Star Building Company) to entitle the lessee to 8 hp. actually consumed, in the absence of a provision stating whether the power was to be thus based or whether the rated capacity of the motors should govern. (233 S. W. 285.)*

Powers of Oklahoma Commission.—The Supreme Court of Oklahoma has declared, in Chicago, Rock Island & Pacific Railway vs. State, that the prima facie presumption of the reasonableness, justness and correctness of an order of the Corporation Commission applies only to the facts found by the commission or established by evidence upon which the commission failed to make a finding. Where a material fact is lacking in the commission's finding and is not supplied by the evidence the presumption alluded to does not apply and on review in the Supreme Court the commission's order cannot be sustained. (201 Pac. 260.)

Present Cost of Reproduction a Necessary Element in Valuation.—Reversing the lower court and remanding the suit of the Potomac Electric Power Company against the Public Utilities Commission of the District of Columbia, the District of Columbia Court of Appeals has ordered a review of the findings of the commission as to the value of the property of the power company "actually used and useful for the convenience of the public." "Whereas here," the Court of Appeals says, "the decision is challenged on the ground that it is based upon a mistake of law, or that it is wholly unsupported by evidence, or is so clearly contrary to the weight of the evidence as to amount to an arbitrary exercise of power, it is the duty of the court, under the rule announced by the Supreme Court, to exercise 'its own independent judgment as to both law and facts,' so far as it is necessary to determine the question in issue." The Court of Appeals further holds that "the present cost of reproduction is one of the necessary elements for consideration, along with other relevant facts, in fixing the fair and reasonable value of the property," observing: "In the present case the commission, in effect, declined to find the present value of the property because not satisfied as to how long existing conditions would continue. In our view it was the duty of the commission to have considered and given due weight to the evidence as to the then value of the property. As conditions changed and values were substantially affected, it would have been the further duty of the commission to exercise its discretion and revalue the property. The conditions existing were world-wide, and while their duration and future effect were problematical, there was no immediate prospect of a return to normal conditions. It may be suggested, although the point was not raised in the opinion of the commission, that practical difficulties would have been encountered in an attempt to ascertain the increase in value of the property between July 1, 1914, and Dec. 31, 1916. But there was substantial evidence before the commission as to the rise in values, and a brief investigation would have enabled the commission to determine, with substantial accuracy, how much in fairness should be added to the earlier valuation."

City Commissioner's Prohibition of Rate Increase Overruled.—In denying an injunction sought by one Silberberg against the Citizens' Water Supply Company of Newtown, the Supreme Court of New York declared that for the Commissioner of Water Supply, Gas and Electricity of the City of New York, without knowledge of the reasonableness or unreasonableness of the old or new rates fixed by a water-supply company, and without investigation, to prohibit any increase over the old rates is in effect an arbitrary determination that the old rates are present reasonable rates, and such a determination may be disregarded by the company. (190 N. Y. S. 349.)

Railroad Not Owning Fee Cannot Enjoin Telephone Wires Across Right-of-Way.—Reversing the lower court in Citizens' Telephone Company vs. Cincinnati, New Orleans & Texas Pacific Railroad Company, the Court of Appeals of Kentucky declares that, both railroad grants and telephone lines being for public use, a railroad company not owning the fee has no such property in the right-of-way as will enable it to enjoin a telephone company from maintaining at a reasonable height across it a properly constructed and managed line, even without grant from the railroad or other authority, as against all but the owner of the fee. (233 S.W. 901.)

Wisconsin Courts Not Divested by Commission Law from Jurisdiction Over Controversies Regarding Failure of Service.—In a suit brought by the Waukesha Gas & Electric Company against the Waukesha Motor Company the defendant interposed a counterclaim, in which it was alleged that the plaintiff had entered into a contract by which it undertook and agreed to furnish the defendant with all of the electrical energy necessary properly to operate its plant and with 2,000,000 cu.ft. of gas a month; that by reason of this contract the defendant equipped its plant with electric motors and with proper appliances, and that plaintiff broke said contract by failing to furnish electrical energy or gas in sufficient quantity, to the heavy damage of the manufacturing company. A demurrer to this counterclaim was sustained in the lower court on the ground that the Railroad Commission had jurisdiction of the case. This demurrer has been overruled by the Supreme Court of Wisconsin, which in remanding the case declared that the jurisdiction of the commission is confined to prescribing rates and regulations for the future and that it has no jurisdiction to redress past wrongs or grievances. (184 N.W. 702.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Uniform Rates Compulsory.—By an order of the Public Utilities Commission of Michigan the Consumers' Power Company is required to charge uniform rates for power delivered to consumers of the same class and using similar quantities of electrical energy under similar circumstances. The company is authorized to reprint its rates for various communities and put them all together in a single schedule.

Extraterritorial Service — Rural Lines.—The Indiana Public Service Commission has authorized the municipal plant of the town of Pendleton to make a higher minimum charge to its rural patrons than to residents of the town on the ground that the cost of rural line upkeep is greater and also because patrons residing adjacent to the town have to pay no part of the construction cost of the municipal plant. The commission has also decreed that a step schedule of electric rates is discriminatory and should be changed to a block basis.

Bars Increase in Rate for Lighting.—The Massachusetts Department of Public Utilities has handed down a decision whereby the Cambridge Electric Light Company is prohibited from charging the Metropolitan District Commission more than $19 a year for each of the 234 electric lamps along Charles River Parkway, Cambridge. At a recent hearing the Metropolitan Commission charged that when it took over control of the parkway by direction of the Legislature the electric light company increased the amount for each lamp from $19, which amount was paid by the city of Cambridge, to $28.70. Officials of the light company gave as a reason that the Metropolitan District Commission was regarded as a "separate customer" and not entitled to the same rate as the city.

Allocation of Expense and Revenue in Two-Department Company.—In an allocation of operating expenses and revenues between the two departments of a combined electric and steam-heating utility made by the North Dakota Board of Railroad Commissioners, operating expenses were apportioned on the basis of labor charges to each department, coal charges were apportioned according to actual demand, general expense was apportioned on the basis of coal cost, office expense on the basis of gross earnings, miscellaneous plant repairs on the basis of coal cost, insurance on the basis of investment, interest on the basis of operating expenses, taxes on the basis of investment and earnings before paying income tax, bad accounts at actual amount, ash conveyor repairs on basis of coal cost, building repairs on the basis of building requirements for each department, certain other repairs on the basis of coal cost, and truck repairs, line labor repairs, meter repairs and meter changing were charged to the electric department.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Theodore E. Burger has been elected secretary of the Society for Electrical Development, Inc. Mr. Burger started his electrical career in 1905, when he became associated with the Western Electric Company in Los Angeles, Cal. He was appointed manager of the Los Angeles branch of this company in 1907 and served in that capacity until 1917. He was chairman of the Los Angeles

T. E. BURGER

Electrical League for two years, and contributed largely to the present co-operative conditions existing on the Pacific Coast.

Charles H. Talmage, formerly manager of the Salt Lake City office of the Rocky Mountain Electrical Co-operative League, has been made secretary of that body in succession to Earl T. Millham, resigned.

Harry Reid has been elected vice-president of the newly formed Indiana Hydro-Electric Power Company, which has been organized for the development of the waters of the Tippecanoe River in the State of Indiana. Mr. Reid is also president of the Kentucky Utilities Company, the Interstate Public Service Company of Indianapolis, and the Southern Indiana Power Company of Indianapolis.

Arthur S. Blair, who has been appointed assistant superintendent of the Edison Illuminating Company of Boston, was formerly connected with the standardizing and testing department. He will now serve as assistant to Mr. Atwood in the general service department. Mr. Blair first entered the service of the Boston company in 1896 in the generating department, but resigned in 1897. He re-entered the company's employ in October, 1903, as test man in the laboratory, later becoming chief clerk and finally head of the office division, which position he held up to the time of his recent transfer.

Weller Rose, consulting electrical engineer, has recently opened an office at Binghamton, N. Y.

E. C. Van Diese has again taken charge of the affairs of the Intermountain Railway, Light & Power Company of Colorado Springs as vice-president and general manager, to replace E. J. Condon, Jr., who recently resigned.

Julian C. Smith, prominent in hydro-electric circles in Canada and vice-president of the Shawinigan Water & Power Company, has associated himself with the Manitoba Power Company as supervising engineer in the construction of the Great Falls power plant.

W. Carrick Wedderspoon of Carrick, Wedderspoon & Company, Christchurch, New Zealand, was a recent visitor in San Francisco and expects to include New York in his United States itinerary. Mr. Wedderspoon has been for some years connected with hydro-electric development in the Antipodes.

Nelson B. Gaskell of New Jersey assumed the chairmanship of the Federal Trade Commission on Dec. 1 for a period of one year. Mr. Gaskell, who was vice-chairman during the past year, succeeds to the chairmanship under the rule of the commission which provides for rotation in the office of chairman among the several commissioners.

Dr. Tatsumi Mochida and **Jiuji G. Kasai**, representatives of the Fuyigasu Spinning Company of Tokyo, are in San Francisco for the purpose of making a study of the hydro-electric developments of California and with a view to purchasing equipment for additional plants contemplated by their company, which operates by electricity plants having an annual output valued at $50,000,000 and in addition supplies light and power to the city of Yokohama.

Wilbur E. Coman has resigned as vice-president and general manager of the Washington Water Power Company to accept a position as Western traffic manager of the Northern Pacific Railroad Company, with headquarters at Seattle. He will be in charge of freight and passenger traffic for the western end of this system, taking up his new duties on Dec. 1. Mr. Coman is one of the best known electric light and power men in the Northwest, his special work being the inspiring of public confidence in public utilities. He began his career as a clerk with the Oregon-Washingon Railway & Navigation Company and rose quickly in the freight department. In 1910 the new Spokane, Portland & Seattle Railway commenced operations with Mr. Coman as its general freight and passenger agent. In 1912 he accepted the position of vice-president and general manager of the new Portland power company, the Northwestern Electric Company. In 1919 he was elected vice-president and general manager of the Washington Water Power Company.

W. R. Arbuckle, the recently elected president of the International Association of Municipal Electricians, has been superintendent of the fire and police telegraph system at Bayonne, N. J., for the past fourteen years. He has also been prominently identified with the affairs of the association during that time. Mr. Arbuckle, who has been a resident of Bayonne for twenty-two years, is a native of New York City. Before taking his present position he had charge of the Bayonne office of the New York & New Jersey Telephone Company and was with that company in Newark, N. J. He has been prominently identified with municipal affairs in Bayonne.

R. A. Manwaring has been appointed general manager of the New Haven (Conn.) division of the United Illuminating Company, and H. F. Leavitt has been appointed superintendent. A. W.

R. A. MANWARING

Kraft, formerly cashier, has been appointed treasurer, Frederick D. Adams, the previous treasurer, having resigned on account of ill health.

A. W. K. Billings, who has recently returned from Barcelona, Spain, will act as construction manager for English and Canadian interests controlling large public utility companies in Mexico, Brazil and Spain and as vice-president of the Canadian Engineering Agency, Inc., of New York City. At present the Mexican Light & Power Company is constructing near Mexico City two hydro-electric plants of 52,000 hp. During the war Mr. Billings was in charge in Europe of naval aviation construction work ashore. He was promoted to the rank of commander in the Naval Reserve and was awarded the Navy Cross and the Legion of Honor.

Dr. E. D. Ball, recently appointed director of scientific work for the Department of Agriculture, has been designated as the representative of that department on the research information service committee of the National Research Council. He fills the place made vacant by the resignation of Dr. Carl L. Alsberg. Dr. Alsberg's place on the division of federal relations of the National Research Council has been filled by Dr. Frederick D. Power, for many years the director of the Wellcome Research Laboratory in London and now in charge of the phytochemical laboratory of the Bureau of Chemistry.

H. C. Soule, formerly manager of the apparatus department of the Westinghouse Electric International Company, with headquarters at East Pittsburgh, sailed from New York on Nov. 19 for Buenos Aires, Argentina, where he will take up duties in the office of L. T. Peck, managing director of the Cia.

H. C. SOULE

Westinghouse Electric Internacional, S.A., of Argentina. Mr. Soule has been associated with the Westinghouse company since 1903. After being graduated as an electrical engineer from Syracuse University he entered the apprentice course at East Pittsburgh. He finished his apprenticeship in 1905 and was detailed as design engineer on power transformers. In 1907 he was reassigned as section engineer on air-blast and railway transformers. Three years later he was made section engineer, and as a consequence of this work in 1913 he was appointed general engineer on transformers and central-station work. In March, 1919, he transferred to the Westinghouse Electric International Company, taking charge of the negotiation section, and after a year on this work was made manager of the apparatus section.

O. Q. Hinds has disposed of his interest in the Anderson Electric & Equipment Company, Chicago, and has severed his connection with the company to engage in the production of electrical automobile accessories in company with B. J. Grigsby, O. E. Grigsby and W. C. Grunow.

T. Charles Brown, formerly with the Electric Service Supply Company and recently with the National Conduit & Cable Company, is now associated with the American Jobbers' Supply Company, Woolworth Building, New York City. In his present connection he will specialize in the product of the Porcelain Insulator Corporation, Lima, N. Y. Mr. Brown has been engaged in engineering sales work in the transmission field since 1910.

William Murdock has resigned after twenty-five years of service as manager of the Northern Electric Company of Halifax, Nova Scotia. During this period he was closely identified with the development of the electric light and power industry of northeastern Canada, and it was largely through his efforts that the Electrical Association of Nova Scotia was brought into being. At the first annual meeting of this association he was unanimously elected its president. Mr. Murdock has not definitely decided on his future plans, but expects to remain in Halifax.

Emory M. Coffin, formerly sales manager of the Pierce Fuse Corporation, Buffalo, N. Y., and B. F. Perry, district manager of the same company in the Ohio territory, have formed a new organization known as the Coffin-Perry Company, with headquarters in Columbus, Ohio. The new company will represent well-known electrical manufacturers in the states of Ohio, Kentucky and West Virginia and in western Pennsylvania.

Obituary

Theodore Stave, who died Nov. 13, at Ballston Spa, N. Y., was born in Naples, Italy, forty-four years ago, of Scandinavian parentage, his father being an artist there. After his studies in electrical engineering in Italy, he finished his education at one of the technical schools of Germany and became an assistant professor in electrical engineering in one of the English colleges, where he attracted the attention of Charles Yerkes, the American builder of the London "Tube," who employed him on electrical construction of this important work, although Mr. Stave was only twenty-four years old. He afterward carried on important electrical development work in Greece and France. He then assisted in perfecting a flaming-arc lamp, brought this article to the United States and organized the Stave Flaming Arc Light Company, which made many important installations. This company was eventually sold to the General Electric Company about 1914. He was later prominent in the American Insulator Company. During the past year he was an important factor in the negotiations of the Chilean government for the placing of

THEODORE STAVE

a large loan in this country. Only recently he returned from a visit to Peru, where he was the guest of the President of that republic. He was a member of various New York clubs, including the Railroad, Chemists' and Rocky Mountain. Mr. Stave, who was an accomplished linguist, did important work for the Allies during the Great War and was active particularly in Belgian relief.

W. M. Wood, assistant general manager of the Pacific Power & Light Company, Portland, Ore., died on Nov. 4. Mr. Wood was born at Vancouver Barracks, Wash., on Jan. 23, 1884. He was educated in Portland and graduated from the Portland Academy in 1902. After studying for a short while in Germany, he entered Cornell University and was graduated as an electrical engineer in the class of 1908. Except for a short period Mr. Wood was with the Pacific Power & Light Company continuously after his graduation from Cornell, having been purchasing agent, local manager at Sunnyside, Wash., assistant manager at Lewiston, Idaho, and assistant general manager at the time of his death. Mr. Wood possessed an attractive personality and exceptional analytical powers. As assistant general manager he accomplished some unusually fine work in the study of economic, rate, interest, depreciation and annuity problems.

W. M. WOOD

James M. Dickie, auditor of the American Public Service Company at Abilene, Tex., died at Dallas last week. Mr. Dickie was born in Aberdeen, Scotland, in 1885 and was educated at Aberdeen University. At the time of his death he was chairman of the Accounting Section of the Southwestern Division of the National Electric Light Association and had also been treasurer for some time of the Southwestern Electrical and Gas Association.

Timothy J. Lynch, superintendent of the municipal electric light system of Danvers, Mass., died three weeks ago from the results of an automobile accident. Mr. Lynch had been in the service of this company for thirty years, having been one of the original committee appointed in 1888 by the Town Council to organize a municipal electric light system. He was made superintendent and general manager of the system and served in that capacity for eleven years, when he resigned to take up work in the leather business. After three years he resumed his former occupation and was again placed in charge of the system, retaining this position until his death.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Armored Conductor Manufacturers Finding Demand Heavy

A SURVEY of the flexible armored conductor market discloses a condition more or less unusual in the electrical field at present, practically all the manufacturers having close-to-capacity business. Demand all through the fall has been steady and manufacturers have kept their production just a step behind orders all the time so that a slow week now and then has not affected them. A few plants are reported to be sold out until after the first of the year while the rest are delaying delivery from two to three weeks. At least one manufacturer has given up production of the smaller sizes in order that he may devote all his capacity to the larger sizes, for which demand has been very good.

Prices are very close to pre-war levels, and there is a desire among producers to raise prices at least until they exceed production and commercial costs. However there are at present three times as many manufacturers in the field as before the war and competition as a result is very keen. While representative manufacturers state that there is absolutely no chance for lower prices, there were none who were of the opinion that an advance was imminent.

Washing-Machine Sales Going Ahead Steadily

WASHING-MACHINE sales since the first of July have increased steadily month by month, and November will be the first month during 1921 to equal 1920 sales for the same period, according to a statement issued by the secretary of the American Washing Machine Manufacturers' Association. This rising curve is a continuation of the one that started last January and increased every month until the slump came in June. In spite of the fact that the country is passing through a critical financial period, the continued sale of these machines would seem to indicate that they are not a luxury, as it is disclosed that the majority of purchasers are of the wage-earning class and not the wealthier class. Dealers all over the country are pushing Christmas drives, and it is felt that if the sales continue in their present volume many prospective purchasers will be disappointed through inability of the factories to make deliveries until after Christmas. Manufacturers state that further price reductions can happen only through reduction of wages and cost of materials.

The washing-machine industry, which was one of the first in the electrical field to feel the effect of the business depression, is also one of the first to show signs of convalescence, according to this report. A number of manufacturers of this appliance have reported very good sales since September, the output of their factories having been increased several times since that date. The recovery evidently caught some manufacturers unawares, as deliveries have become slower. One particular maker has issued a notice to his dealers to the effect that machines ordered after a certain date cannot be delivered before Christmas. Dealers' stocks have not been extremely heavy. Production was cut down to the bone early in the year, so that the whole industry is starting out for new business with a clean slate.

Manufacturers of fractional-horsepower motors report good business from this source, which they are in a position to supply on account of the large stocks left on their hands when the demand for washing machines dropped off last year. The washing-machine manufacturers themselves at that time had large stocks of motors which present orders seem to indicate have been for the most part used up.

Revision and Change of Motor Prices Announced

SEVERAL manufacturers of motors have announced a revision of their price lists within the last few days. In some cases this has not meant a great deal of change in the average price for the whole line made by a manufacturer, but rather a co-ordination of prices. One manufacturer has reduced small two-phase and three-phase motors under 5 hp. from 3 per cent to 7 per cent, while prices on the larger motors are untouched. Three representative manufacturers have reduced prices on alternating-current motors from 5 to 13 per cent, according to size and type. In this case motors from 50 hp. to 100 hp. are not much affected. Direct-current motors are firm, though demand is not heavy.

The demand for motors varies considerably in different sections of the country. Around New York, it is reported, sales are increasing, more orders having been booked by a large manufacturer in November than in either October or September. Both inquiries and sales were about double the number received in January. Inquiries in New England are better, with gradual improvement in sales. Improvement in general industrial conditions is resulting in better motor sales. In the Middle West the improvement is less noticeable, large-size motors being very slow. Fractional-horsepower motors are moving better. Increased industrial activity is bringing more sales in the Southeast. Synchronous motors and induction motors for ice-plant operation have been in demand there.

Average Building Cost Index Still Almost Double 1913

SINCE the recovery of business, it is agreed, depends to a large extent on construction, it is interesting to note that figures supplied by the Department of Commerce show that on the average the costs of building material are still far above the average of 1913. Taking that year's prices as an index of 100, the general average for twenty-eight principal commodities is 192. This, however, is not a weighted average, so that the actual cost of building a house is lower than is indicated by that figure, the index of the most-used materials being below the average index. Only the most important items are listed in the table below. The indices are all based on Pittsburgh prices where obtainable and on base prices otherwise. It will be noted that the index for steel is lower than for

INDEX OF VARIOUS BUILDING MATERIALS, SHOWING VALUE ON NOV. 1, WITH 1913 AVERAGE AS 100

Common brick	213	Wire nails	197
Portland cement	149	Window glass	225
Yellow pine	150	Hollow tile	166
Red cedar shingles	153	Reinforcing bars	118
Lime	138	Structural steel	117
Building sand	162	White lead	163
Crushed stone	219	Tar paper roofing	488
Average for twenty-eight commodities			192

any other material. This bears out the denial of steel interests that high price of steel is a deterrent to building.

A sidelight on the building situation comes from the Chamber of Commerce of the United States, which has announced that 57.9 per cent of the total construction in the first ten months of 1921 has been for residences against only 36.1 per cent during the same period of 1920. The total to Nov. 1, 1921, is only a few per cent behind the total for all of 1920. The estimated cost of all construction reported in forty-four important cities for the first ten months of 1921 exceeds $722,000,000, of which $349,000,000 is residential and $254,000,000 non-residential. Alterations, repairs and special construction cost $119,000,000. As costs have been reduced, each dollar this year represents an increased volume of construction.

Ten per Cent Cut Announced on Northern White Cedar Poles

POLE producers have published a cut on Northern White cedar poles, effective Dec. 1, which makes a difference in delivered cost of from 5 to 10 per cent, according to size. The decrease was made in order to bring prices on the Northern poles into line with those on Western poles, which had been reduced during the early part of November: Prices on Northern white cedar poles, f.o.b. New York, are as follows: 40-ft., 8-in., $16.50; 40-ft., 7-in., $14.35; 35-ft., 8-in., $14.10; 35-ft., 7-in., $11.85; 30-ft., 7-in., $8.55; 30-ft., 6-in., $6.80; 25-ft., 7-in., $6.80; 25-ft., 6-in., $5.05. There has been an increase of 10 to 15 cents per pole on Western red cedars within the last few days to take care of changing through freight rates.

Demand for the Northern white cedar pole in the East is normally small. The main supply goes to the Middle West. Stocks are good and immediate deliveries can be made. Cross-arm quotations have been reduced several times in the last few months, and producers state that prices are now as low as possible. Some hope has been placed in a reduction of freight rates, but even if these were down to 1913 levels it would make only about 10 per cent difference in delivered prices.

Revision and Extension of Export Classification

A REVISED and extended export classification has been approved by the Secretary of Commerce to be effective on exports from the United States on Jan. 1, 1922, according to the announcement of the Department of Commerce. Instead of the alphabetical listing heretofore used in the published statistics the commodities in the new schedule are classified into ten great groups, according to origin of material or according to use, bringing together related items for each industry. The large groups are subdivided according to kinds of material or products, and further according to distinctive lines of industry or degree of manufacture, with the individual commodities shown under each heading. The arrangement facilitates comparisons of the exports with the imports and with statistics of production collected, by the Census Bureau, Geological Survey, and individual industries, which are in many cases difficult under the present statistical arrangement.

The new classification also lists 1,250 items, an increase of 76 per cent over the 710 previously listed. A particularly valuable innovation is the decision to list quantities on all commodities so that fluctuations in volume of trade can be noted. On account of price fluctuations it has been impossible to do this heretofore on commodities whose money value only was given. Information on this point is to be required of all shippers, according to the announcement, the detailed description of the merchandise to be furnished to the collector of customs at the port of exit before the shipment will be permitted to clear. The new schedule will be ready for distribution by Dec. 15 and will be for sale at district and co-operative offices of the Bureau of Foreign and Domestic Commerce.

Line Hardware Prices Reduced an Average of 10 per Cent

REDUCTIONS on line hardware of all sorts have been announced. New net prices quoted by a representative manufacturer include suspension-insulator fittings, pierce-forged steel pins for wood and steel arms, cross-arm saddles, centering washers, pole-top brackets, steel pins, clamp pins and clamps, wood-top pins, ridge irons, angle and standard cross-arm braces, through, machine, spacing and eye bolts, washers, strain plates, anchor or guyrods, pole steps, turnbuckles and tools. The average reduction is approximately 10 per cent and is the second since July 1, the other having been made Sept. 1.

Manufacturers state that the drop was put into effect in an effort to stimulate the market for line material and that some increase in demand has been noted. Many central stations are well stocked against seasonal requirements, as was the case with the utilities in eastern Massachusetts that made repairs out of stocks to lines damaged in last week's sleet storm there. A heavy call for this material recently came from the Pacific Northwest, where a blizzard had done considerable damage.

Metal Market Situation

SALES of copper in the month just ended were the largest in any month since the armistice, and the market is holding strong as a result. Definite figures are not available, but authorities estimate the total sold in the export and domestic market at over 160,000,000 lb. Great Britain, France and Germany have been particularly heavy buyers, with Japan and Italy also buying. A good percentage of this total has been sold on future delivery but it is thought that the stock of surplus copper in the country has been reduced by at least 100,000,000 lb. The outlook for resumption of mining is considerably brighter from a statistical point of view.

The first week in December has been equally satisfactory, and prices have advanced, not sharply but just enough to encourage the buyers. The policy of the producers seems to be not to force the market unduly but to take advantage of the law of supply and demand. Too heavy future buying, which might create a lull, is discountenanced by higher prices. Thus the nearer positions are the weaker, and December copper was obtainable Tuesday at 13.75 cents. Some producers, having disposed of all they care to at present prices, have withdrawn from the market entirely and are holding for 15-cent copper. Some predict this price as certain by the first of the year. On account of the withdrawal from the market of so many producers, it is rumored that plans are under way to borrow 100,000,000 lb. from the export association for domestic use. This, of course, would be replaced later. The London market has advanced 2s. 6d.

Copper wire has followed the market as had been expected and has advanced from 14.50 cents to 15 and 15.25 cents per pound within the last two weeks.

NEW YORK METAL MARKET PRICES

	Nov. 28, 1921	Dec. 5, 1921
Copper	£ s d	£ s d
London, standard spot	66 7 6	67 5 0
	Cents per Pound	Cents per Pound
Prime Lake	13.50	13.75
Electrolytic	13.50	13 62½
Casting	12.87½	13.00
Wire base	14.75—15.00	15.00—15 25
Lead, Am. S. & R. Co. price	4.70	4.70
Antimony	4.55	4.55
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	9.00	9.00
Zinc, spot	5.15	5.40
Tin, Straits	30.00	31.75
Aluminum, 98 to 99 per cent	19.00	19.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	10.50 —11.00	10.50 —11.37½
Brass, heavy	5.00 — 5.25	5.00 — 5.50
Brass, light	4.75 — 5.00	4.75 — 5.25
Lead, heavy	3.75 — 4.12½	3.75 — 4.12½
Zinc, old scrap	2.50 — 2.75	2.50 — 2.75

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

JOBBERS and dealers in the past week have focused much of their attention on Christmas business, and reports indicate that it will be good but not startling. The Pacific Coast is optimistic concerning the probable total of holiday trade, San Francisco jobbers and dealers declaring that already it has surpassed the same period last year. In the Pacific Northwest reports are less optimistic, many dealers depending on the jobber to carry stocks. Prospects are fair in the Intermountain region, despite tight money. Coming further east, both St. Louis and Chicago report holiday business started and progressing moderately. Atlanta advises of a slump in this trade, but it is expected to disappear as soon as fill-in orders materialize. New York and Boston note Christmas business as beginning to pick up.

Wiring supplies seem to be in demand, steady rather than heavy, in all parts of the country. This finds its explanation in the pleasant weather which has prevailed, permitting construction of all sorts to go ahead. Building permits all over the country maintained their high volume during November, and employment, both in the building and industrial field, has increased somewhat.

NEW YORK

Business in the electrical trade continues at about the same level as last week. The demand for wiring supplies is steady, and jobbers are making most of their shipments out of stock. Heating appliances and household devices are showing more activity, but jobbers generally feel that holiday sales this year will not come up to those of last year unless there is a last minute spurt of buying on the part of the consumer.

Sales of unit-type commercial lighting fixtures have been good, and those jobbers who have special salesmen on this class of business report very satisfactory results. The demand for industrial-type reflectors has increased noticeably, indicating an improvement in manufacturing activity. A leading manufacturer of schedule material stated that the company's factory is now working about 750 employees as against a minimum of 150, the lowest point reached during the past year. This manufacturer is operating only on orders actually received and at the present time is from a week to two weeks behind on deliveries.

Conduit.—Demand has been steady, the smaller sizes showing the most activity. Prices remain unchanged, jobbers' quotations this week being as follows: For ½-in. black pipe in 2,500-ft. lots, $48.90; ¾-in., $62.70, and 1-in. $89.32 per 1,000 ft. Galvanized pipe in the same sizes was quoted at $53.97, $69.58 and $99.47 per 1,000 ft.

Flexible Armored Conductor.—This material continues in strong demand and, while jobbers are able to make immediate delivery of small quantities, stocks are rather spotty. Some manufacturers cannot make deliveries short of two or three weeks. No change in price was reported. No. 14, two-wire, single-strip, was quoted at $44.50 to $46 per 1,000 ft., and double-strip at $46.50 to $48 per 1,000 ft. in lots of that quantity.

Rubber-Covered Wire.—Although quotations on copper have strengthened, this has not yet been reflected in prices on rubber-covered wire in this section. Large stocks in some jobbers' hands tend to hold prices at their present level. No. 14 was quoted this week at $6.50 to $6.77 per 1,000 ft. in 5,000-ft. lots.

Motors.—Two leading manufacturers have announced a reduction in the prices of alternating-current motors. The new prices are from 3 per cent to 13 per cent lower than formerly and apply to some motors up to 50 hp. in size.

Lamp Cord.—There has been no change in demand for this material. Stocks generally are good. No. 18, cotton, twisted, is quoted at $12.90 per 1,000 ft., and parallel in the same size at $15.60 per 1,000 ft.

Fuse Plugs.—Demand is steady, and most jobbers' stocks are fair to good. In lots of 1,000 or more standard fuse plugs sell for $22 per 1,000.

Heating Appliances.—Household devices, including grills, chafing dishes, curling irons and hollow ware, show more activity. Jobbers report, however, that orders are for smaller quantities than last year and a last-minute rush is expected. Stocks are fair and prices remain unchanged.

CHICAGO

Activity along electrical lines continued fairly steady during the week. Wiring materials in general have not advanced in price and are moving fairly well. A few jobbers report that Christmas business has started and is progressing well. Since the industries have not been operating at capacity for some time, the call for motors of large size has been dull, and the demand for fractional-horsepower motors here has not been very much better, although prices quoted are often cut.

Although unsettled disputes in the building industry combined with the approach of winter have tended to reduce the number of building permits issued for November, the total number of permits for that month was 721, with a valuation of $12,389,000, an increase over the number issued in November, 1920, of 481. The citizens' committee which is backing the Landis award is making the majority of reluctant contractors and building trade unions see some light on this matter. During the week it was announced that the builder who had been refused a loan of more than $1,000,000 by reason of his failure to obey the Landis wage award had changed his mind and is willing to abide by it.

Wire.—Activity on rubber-covered No. 14 is still maintained at prices varying between $6.40 to $6.60 per 1,000 ft. in 5,000-ft. lots. Some jobbers have good stocks, though the majority of them are operating on fairly low supplies. Weatherproof wire is continuing its steady movement and is still selling at about 16½ cents per pound in 1,000-lb. lots. Bare-wire base is also quoted at 16½ cents.

Flexible Armored Conductor.—This material is going fairly well. No. 14 two-wire, double-strip, varies from $44 to $50 per 1,000 ft. in 5,000-ft. lots.

Conduit.—The call for conduit is holding steady along with wire, and some good prices have been quoted by a few jobbers. Black ½-in. pipe in lots of 5,000 ft. sells at prices between $43 and $48 per 1,000 ft.

Heating Appliances.—Good sales on these are reported, but several dealers declare that the people in general are so interested in prices that they do not buy until after they have "shopped around" for better quotations. On the whole, dealers' stocks are sufficient.

Motors.—Large-size motors are not moving well, although one manufacturer reports sales on several large-size synchronous motors to central-station and industrial plants. Another company has revised its price lists, which now contain reductions in some cases amounting to about 8 per cent. Fractional-horsepower motors are moving better than the larger sizes.

Signs.—Electrical signs are reported moving briskly, with an increase over the preceding month. This activity includes both large and small sizes.

Meters.—Sales have held steady during the last month. Demand for switchboard meters for central stations has increased every month since July, but at present they are moving a little slower. The demand for portable meters has been brisk.

BOSTON

Trade this week is being maintained fairly well, with unusual activity in linemen's tools and supplies following the recent disastrous sleet storm. Cross-arms are moving faster for the same reason, and the smaller companies have been buying more pole-line material. Prices are lower on several makes of alternating-current motors, but are steady in other lines, barring upward tendencies in wire. Open weather has enabled building operations to be continued into early winter. General industry in New England looks much more hopeful, although the metal-working plants are slow to advance to large volumes of business. No shortages of supplies are reported outside linemen's equipment. Central-station companies are losing considerable revenue from interrupted street-lighting and residential service, but service is rapidly being restored by extra crews. The beginnings of a holiday retail trade in appliances are now well apparent.

Motors.—Prices on three representative makes of alternating-current motors have been reduced from 5 to 13 per cent, varying according to sizes and types. Larger motors are less affected, one leading maker of units of 50-hp. to 100-hp. rating having made no change in these. One manufacturer has reduced his squirrel-cage motors of 5 hp. and under by 10 per cent. Direct-current motors are firm. Inquiries are better, with gradual improvement in orders.

Wire.—The market is rather dull, notwithstanding upward price tendencies. Reserve stocks of public utilities were large enough to mean little immediate increase in purchases for post-storm reconstruction. No. 14 rubber-covered was moving Monday at $6.25 per 1,000 ft. in 5,000-ft. lots to $5.75 in 25,000-ft. lots. Weatherproof base is 16 cents, and bare base, with slight movement, 15½ cents.

Flashlamps and Dry Cells.—Jobbers report a good seasonal business, without spectacular sales resulting from the temporary interruption of street-lighting and residential service. Undoubtedly retail demand has been somewhat increased by the recent storm, but it has not hit the distributer to any extent.

Appliances.—Quickened retail trade is evident in the smaller appliances, but washers and cleaners are dull this week. Interest in hollow ware, radiators and portable lamps is encouraging. Stocks are plenty large.

Linemen's Tools.—Climbers' straps, body belts, etc., are very scarce, following the requirements of line reconstruction due to the recent storm. Among even the largest houses this material was at a premium Monday.

Pole-Line Material.—Cross-arms are in great demand, but stocks are apparently satisfactory. Poles are moving a trifle faster as a result of last week's storm. One leading house sold three carloads of poles and 10,000 cross-arms last week, chiefly to smaller utilities. Hardware is plentiful, and reserve stocks among users are being drawn upon to meet the reconstruction needs.

ATLANTA

Electrical jobbing interests report a slight falling off in the volume of orders during the past week, caused largely by the fact that the more substantial firms had placed holiday orders previous to this time, while the smaller firms are holding off as long as possible. The jobbers seem to think that within the next ten days or two weeks the volume will again increase as fill-in orders for holiday goods begin to materialize. Orders from contractors for wiring material continue to hold up quite satisfactorily, owing largely to the record building that is going on throughout the section. In Atlanta all building records for the month of November have been broken, the total valuation reaching $667,661, making the aggregate for the year $10,666,220, as against $13,000,000 for the same period of 1920, when prices were much higher. It is worthy of note that May, July, August, October and November of 1921 have exceeded the same months of 1920, while September was practically the same as in 1920. Building permits in the principal cities of the Sixth Federal Reserve District for October totaled 3,126, valued at $5,716,912. Of the eight lines of wholesale activities in this section, five showed increases in sales during the month of October over the previous month, while in the three lines showing decreases the drops were very slight.

Air Heaters.—Owing to the very mild weather this line is dormant. Because of the heavy carry-over from last winter, few orders are being made on manufacturers, and all jobbers report very satisfactory stocks on hand.

Poles.—A recent price reduction of approximately 10 per cent seemed to stimulate the movement of poles, and all jobbers report very satisfactory orders. Chestnut and cypress varieties continue to lead in popularity, one jobber reporting that sales in the latter variety this week equaled those for any month since April. Producers have good stocks on hand and are making prompt shipments.

Oil-Engine Generating Sets.—An extensive campaign by one of the jobbers in this section is causing an increased movement in individual lighting plants, while reports indicate that there is increased interest in and up to 100-hp. sets. Stocks in the smaller sizes are low, but factory shipments on the larger sizes are prompt. A recent price reduction of from 10 per cent to 12 per cent is reported.

Industrial Motors.—Increased industrial activity is responsible for increased sales in this line, particularly in the past two weeks. There is an increased demand to be noted in synchronous motors, as well as in induction motors for ice-plant operation. Stocks are good with shipments from one to four weeks.

Heating Appliances.—Owing to the holiday demand business is very brisk, with flatirons leading in sales. Hollow ware is also reported as moving satisfactorily. Confidence in the price guarantee to Jan. 1 is assisting materially in the sales to the retail trade. Stocks are in fair to good condition.

Washing Machines.—A price reduction of approximately 12 per cent in this speciality was announced this week. A feeling is quite apparent among all the trade that considerable time will elapse before this line will again become active. All firms report heavy stocks on hand.

ST. LOUIS

A slight recession in the volume of sales was experienced by jobbers here last week, but it was not of sufficient magnitude to cause concern. In fact, except for these slight variations, business has been steadily bettering for several months. November sales of the various jobbers were from 10 per cent to 15 per cent better than those for October. Demand for electrical goods for use in residential construction is falling off slightly, and the appliance business is taking its normal decline, but these factors are to a large extent offset by better buying on the part of industrial concerns.

While buying in every field is on a very conservative basis, business throughout this entire territory is gradually bettering. The farmers have been in a precarious position because of the marked drop in prices for farm products, but are showing some ability to get out of their difficulties. Factories are continually increasing their production. Shoe factories are all running well, and those making the lower-priced shoes are operating at capacity. All metal industries are in improved condition and a number of the steel mills are running full force. The packing plants are quite busy, but may be adversely affected by a strike expected to be called next week. Woodworking plants are steadily increasing their output.

Wire.—Movement for the week was about the same as for the past month, though some decline was felt in the call for No. 14 rubber-covered. Stocks are becoming more in line with the demand. No. 14 rubber-covered is selling for $6.50 per 1,000 ft. in 5,000-ft. lots and for $6.40 per 1,000 ft. in 10,000-ft. lots. The base price on bare is $15 per 100 lb. and that for weather-proof is $15.50 per 100 lb.

Tape.—In 100-lb. lots rubber tape is priced at 36 cents per pound, friction at 38 cents and sticker at 34 cents.

Stocks have been increased to a normal basis and sales are maintained in good volume.

Lamp Cord.—Cotton cord is moving fairly well, but the silk-covered is still quiet. Good stocks are on hand in the cotton, but, because of the slow movement, silk stocks are very low. In 5,000-ft. lots No. 18 twisted cotton is selling for $18 per 1,000 ft., No. 18 twisted silk for $27 per 1,000 ft., and No. 18 parallel silk for $28.80 per 1,000 ft.

Knobs.—"Nail-it" knobs are quoted at $19.50 per 1,000 in barrel lots, with slightly easier prices where large stocks were bought before the recent price increase. The demand has been strong and stocks generally are in line.

Fuses.—Lower prices prevail on plug fuses, the clear-window style being sold for $2.75 per 100. Stocks have been short but are well up this week. The demand is holding up in good shape and the railroads have recently been heavy buyers.

Sockets.—Improved sales are reported and stocks are complete. The following are representative prices when sold in standard packages: Key, $18.15 per 100; keyless, $16.50 per 100; pull, $33 per 100.

Conduit.—Brisk sales are reported by a number of jobbers. The low stocks in the smaller sizes have been built up, and the heavy stocks in the larger sizes have been to a slight extent decreased. The following net prices have been established: In bundle lots of 100 ft., ½-in. black, $4.73 per 100 ft., and ½-in. galvanized, $5.32 per 100 ft.; in bundle lots of 50 ft., ¾-in. black, $6.20 per 100 ft., and ¾-in. galvanized, $6.86 per 100 ft.

SALT LAKE CITY—DENVER

"Say Merry Christmas electrically" is the holiday slogan of electrical dealers. The campaign is launched and, backed by liberal advertising, bids fair to bring a big volume of sales. Just now the daily papers are carrying more electrical merchandise advertising than has been seen in their columns for many months. On many items price reductions are featured as the chief selling argument. Jobbers report that while dealers are not stocking holiday merchandise in big quantities, yet they are placing orders that indicate considerable anticipated activity. Jobbers' stocks are good.

Heavy tax delinquencies, especially among farmers, are evidence that money is still tight and that Christmas spending will be conducted along extremely frugal lines. It is still hard to negotiate loans, except from sources provided by the government as emergency help. A "buy-something-made-of-copper" campaign has been started in the hope that a larger demand for the product will be created and the revival of the industry hastened.

Buying generally is improved over the condition that has obtained for several weeks. A flurry of snow and a sharp cold wave have revived shopping gratifyingly.

Christmas-Tree Lighting Outfits.—Dealers are stocking well in anticipation of a good demand. Units of light festoons that can be plugged on and lengthened indefinitely are most called for. Stocks will likely be ample.

Flashlights.—Flashlights are in high favor as a gift for men and boys. The holiday trade will be up to standard, jobbers say. Dealers are stocking a good assortment.

Electric Dishwashers.—Dishwashers are making slow progress in finding a market in this region. The need for such an appliance does not seem imperative enough to the housewife to warrant the investment. The size for domestic use is selling at about $100 to $125. A great deal of educational work is benig done by the jobbers.

SAN FRANCISCO

Business conditions are much better and are more nearly approaching the briskness of the summer of 1920. Christmas business especially is of an appreciable volume, many firms reporting that early in December it already surpassed the sales of Christmas week last year. However, 1922 is being conservatively expected just about to equal the business volume of this year. Export business is far better than it was a few months ago. Its volume is chiefly composed of such natural products as oil and dried fruit, but the fact that this business is better proves that the export business is opening up.

The list of building permits for November, 1921, is as follows: Los Angeles, $8,454,387; San Francisco, $2,444,606; Oakland, $1,235,174. The corresponding figures for November, 1920, were as follows: Los Angeles, $6,267,660; San Francisco, $1,340,950; Oakland, $563,676. San Francisco shows a steady and cumulative increase of building since the building strike of last summer.

Fuse Plugs.—New prices on standard 125-volt non-refillable fuse plugs are $2.75 per 100 in package lots, with a 7½ per cent better price in quantities of 5,000. Sales are good and local stocks are well maintained.

Snap Switches.—Indicating snap switches of 5-amp. rating are now selling for 23c. each, non-indicating for 20c. each in standard package lots. Carton lots take a 10 per cent higher price. Local stocks are good.

Push Switches.—Radio-handle push switches are being sold in standard package lots for 54c. each in the single-pole cheaper grade and at 63c. each for the higher grade. Three-way switches of this kind are selling respectively for 90c. and $1.08 each. Cartons take a 15 per cent addition to the above prices.

Wire.—No. 14 rubber-covered, single-braid, solid is being quoted generally at $7 per 1,000 ft. in 5,000-ft. lots, with 5 per cent additional for single coils. Weatherproof wire is moving rather slowly. What little is being sold is priced at 19c. per pound for the base sizes of the three-braid solid style in 500-lb lots.

SEATTLE—PORTLAND—SPOKANE

A terrific gale struck Portland on Thursday, Dec. 1, the worst in twenty years, and the high wind together with falling trees interfered with service seriously and caused considerable damage to the distribution lines and service lines of the light and power and telephone utilities. Stocks of line hardware, insulators and some sizes of wire of the local electrical supply houses were in many instances entirely depleted as a result of the unprecedented demand for these lines occasioned by the sleet storm of the previous week, which did damage to distribution and service lines amounting to many thousands of dollars. Manufacturers and jobbers report business a trifle weaker, probably owing primarily to the stormy weather. Activity centers around heating devices, lamps, fixtures, wiring materials and holiday goods.

A well-sustained building program in and around Seattle makes rubber-covered wire, porcelain and other material entering into this class of construction in good demand. Lumber shipments and production show a slight falling off from previous weeks, indicating something of a slowing down of the activities in the industry.

The following quotations come from Seattle:

Knife Switches.—A price reduction of 20 per cent became effective during the week. Safety switches are required in th urban districts by city ordinance, whereas open switches are sold largely through the country districts. Unfused double-pole, single-throw 30-amp. switches sell at $1 each.

Tape.—The demand for this item is fair. Slight increases in price for certain of the better qualities were recently made. Half-inch friction tape now sells at $25.95 per 100 rolls.

Sockets.—Sockets in standard packages are quoted as follows: Pull-chain, $36.60; key, $19.80; keyless, $18. Jobbers note a tendency on the part of retailers to buy parts rather than standard packages. This procedure enables them to make up from parts the sockets desired and considerably cut down the stock which they must carry.

Christmas Business.—Retailers apparently are not laying in Christmas stocks as heavily as could be expected, but seem to be going on the supposition that the jobbers will carry the stock for them, and it is feared that there may be some disappointment later owing to short jobbers' stocks.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Kilbourne-Clark to Have New Factory

The Kilbourne-Clark Manufacturing Company, whose Seattle (Wash.) plant was recently purchased by the Westinghouse Electric & Manufacturing Company to be used as its Northwestern distributing headquarters, will occupy a new factory which is being erected at the corner of First Avenue South and Spokane Street. When completed the building will be one of the most complete in the West and will employ approximately 300 men. The company will continue to manufacture electrical and wireless equipment.

Robbins & Myers to Make Radio Apparatus

Announcement was made at a conference of district sales managers of the Robbins & Myers Company of Springfield, Ohio, held in that city Nov. 25 to 29 inclusive that the company would begin the manufacture of high-voltage radio apparatus. This is a new line for the Robbins & Myers Company, which heretofore has devoted its activities to the making of motors for power machinery, fans, etc.

District sales managers from all parts of the country were present at the conference and reported on conditions in their territory. In the main a spirit of optimism pervaded the conference over the outlook for the coming year, although some of the managers reported that conditions in their districts were not promising owing to local depression. Sales and advertising plans for 1922 were explained and discussed.

The company expects largely to increase production after Jan. 2. The plants at Springfield will be closed from Dec. 17 to Jan. 2 for inventory.

Motor Manufacturer to Increase Output with New Factory

Plans are under way by the Jeannin Electric Company, Toledo, Ohio, for the construction of a new factory, according to an announcement of the company. The new building, which will be situated at Fassett Street and the New York Central crossing, will enable the company to triple the present output of single-phase, repulsion induction electric motors, ranging from ¼ hp. to 25 hp.

Work on the first unit, which is to consist of a one-story brick and concrete factory building and an office building, has been started and is expected to be finished by Jan. 1. The plans are so drawn that additional units may be added as needed. The company had not expected to build for another year, but a sudden increase in orders caused the officials to take the necessary steps for the return to better business conditions, which they anticipate from the recent influx of orders.

The company was formed in July, 1919, and started production immediately. It has had a rapid growth. At the present plant, on Eleventh Street near Monroe Street, it employs fifty men, while in the new plant it will employ 150 men, consisting largely of skilled labor. The officers are: Carl H. Clement, president; H. W. Jeannin, vice-president, and M. C. Seeley, secretary. The capitalization is $250,000.

Apex Company Adds Ironer to Line

The addition of an electric ironer to the other home appliances manufactured by the Apex Electrical Distributing Company, Cleveland, Ohio, has just been announced. The company has been manufacturing suction cleaners and washing machines. The ironer is being made in the 42-in. size and is gas-heated and electrically operated. It is listed at $137.50 east of Denver and at $147.50 in Denver and west of there.

Two-Year Construction Record for Stone & Webster

Within the last two years steam and hydro-electric plants have been completed or placed under construction for public utilities by Stone & Webster, Inc., to the extent of 328,700 kva. in seventeen companies and independent boiler plants for five other companies, aggregating 20,521 boiler-hp. Construction work of various kinds for sixteen different companies was begun this year.

Vacuum Company Issues Lubrication Data

Four carefully prepared pamphlets dealing with the proper lubrication of horizontal steam turbines, stationary steam engines, oil engines of the surface ignition type and air compressors have just been issued by the Vacuum Oil Company, New York, for distribution to central stations and owners of private power plants. The booklets are profusely illustrated, showing by diagrams and pictures the operation and the methods of lubrication of the various power units described.

Increased Sale of Commutator Dressers Noticed

Orders booked by the Ideal Commutator Dresser Company for commutator dressers during the past few months have shown a very good percentage of increase, according to J. W. Becker of that company. Both central-station companies and industrial plants are ordering more freely than was the case six months ago, indicating increased activity. On account of larger sales and increased production, according to the announcement, a reduction in price has recently been put into effect by the company.

Navy Magnet Wire Order to Rockbestos

The Rockbestos Products Corporation, New Haven, Conn., has announced that it has secured the order for the asbestos-insulated magnet wire to be used in the electrical installations on a number of United States Navy submarines now under construction. The order was placed by the Ridgeway Dynamo & Engine Company, Ridgeway, Pa., which has the contract for the entire electrical installation. It is estimated that about twenty-six tons of this kind of wire will be required.

Storage-Battery Campaign in Newspapers

In an effort to familiarize the public with the various uses of storage batteries and to create confidence in the ability of battery-propelled vehicles to compete with gasoline vehicles, the Electric Storage Battery Company, Philadelphia, is carrying on a widespread newspaper advertising campaign. The latest advertisement appeared on Nov. 17 in 133 newspapers, published in 117 cities throughout the country. The combined circulation of these papers is more than 8,000,000, and the company estimates that this means that the advertisement will be brought to the attention of over 25,000,000 people throughout the country. The latest advertisement in the series is entitled "Lifting Labor's Yoke" and emphasizes the part that industrial tractors are playing in industrial plants and in moving baggage and freight for railroads.

Westinghouse Opens New Radio Broadcasting Station

On account of the great success and widespread interest that have been the outcome of pioneering in radio-telephone broadcasting by the Westinghouse Electric & Manufacturing Company the company has announced a complete plan for covering the United States with a service to the home that will allow anyone anywhere in the country to enjoy the many benefits of radio. The first radio broadcasting station of its kind in the country has been operated at East Pittsburgh, Pa., for the past twelve months.

In order to cover certain parts of the country not reached by this station and to intensify the service to other parts, the Westinghouse company has laid out a complete program and has added three stations. At Springfield, Mass., station WBZ supplies New England; at Newark, N. J., station WJZ takes care of the Middle Atlantic and Southern States, and at Chicago, station KYW gives service to the Middle and Western States.

The service at East Pittsburgh started with the transmission of Presidential election returns in November, 1920, and has progressed through the broadcasting of phonograph music, entire church services, speeches of prominent men, acts from theaters, musical recitals, sporting events, market reports and national and international news of all sorts. There will be various local features at the other stations, including broadcasting of complete operas from Chicago.

In order to perfect the transmission of music by radio, engineers of the Westinghouse company have made considerable research studies of the differ-

ent frequencies of music. A studio has been built especially for the singing of artists so that the reproduction will be accurate. The studio at East Pittsburgh consists of a room 20 ft. x 30 ft. completely lined with burlap and cloth and without windows, so that there will be no reflection of sound. A chart is used to determine the proper position of the microphone and a report is made for each musical selection. These reports are checked later with the reception qualities at a receiving outfit. Data already obtained indicate the proper methods of transmitting various types of music.

Independent Steel Merger Reports Confirmed

Reports that plans are under way for merging several independent steel companies have been confirmed by James A. Campbell, president Youngstown Sheet & Tube Company, who states that consolidation of his company with the Steel & Tube Company of America and the Inland Steel Company is under consideration and may be put through by April 1, 1922.

It is further reported that another steel merger is being considered, to include the Republic Iron & Steel Company, Midvale Steel & Ordnance Company, Lackawanna Steel Company, Brier Hill Steel Company, Youngstown Sheet & Tube Company, Steel & Tube Company of America and Inland Steel Company. Both of the proposed consolidations, however, are far from completed.

There is reason to believe that physical valuations of the properties have not yet been made and that nothing like a definite exchange basis for stocks of the several companies has been arrived at. The seven companies together have developed a producing capacity of 7,400,000 tons of steel and an aggregate present capitalization of $467,000,000. Only two of the companies, the Youngstown Sheet & Tube Company and the Steel & Tube Company of America, make finished products for the electrical industry, but several others sell a percentage of their products to electrical manufacturers as raw material. It is pointed out that consolidation of the independents would put them in a position to meet the prices of the United States Steel Corporation and produce real competition

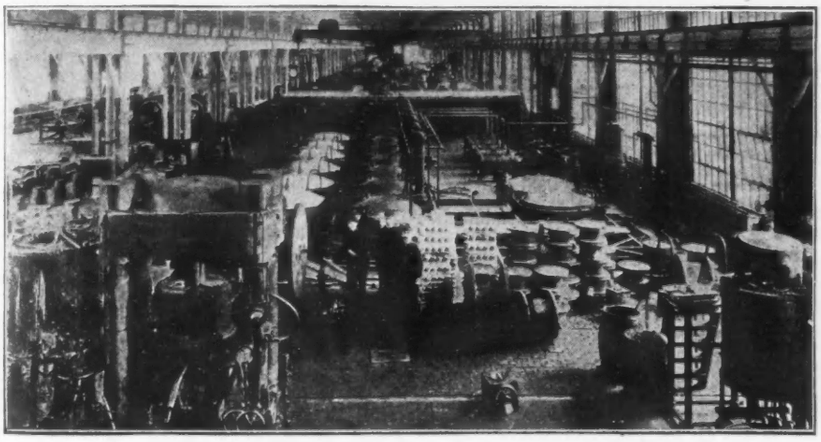
New G. E. Cable Shop at Schenectady

Increased facilities for the manufacture of paper-insulated cable are afforded the General Electric Company by the recent completion at Schenectady of a new cable shop having 85,000 sq.ft. of floor space. The new shop is 850 ft. long by 100 ft. wide. The various machines in the shop are so arranged that the raw materials enter at one end of the building and the finished lengths of cable, tested and wound on reels ready for shipment, are loaded into cars at the other end. In their course through the building the cables are stranded, insulated, leaded and tested for dielectric strength, insulation resistance, etc.

Among the various machines are a number of large bobbin stranders, high-speed insulation machines for applying the paper insulation, impregnating vats, vacuum driers, lead presses for applying the lead sheaths, and a number of other machines for various purposes, such as applying band steel armor, wire armor, or coating the cables with compounded jute.

Besides the lead-sheathed paper-insulated cable, the shop is equipped for making single and multiple conductor band-steel armored cables and steel-wire armored submarine cables. Cable sizes which are manufactured at present range from 3,000,000 circ.mil to No. 10 B. & S. in single conductor, from 1,500,000 circ.mil to No. 14 in double-conductor and from 750,000 circ.mil to No. 14 B. & S. in three-conductor. The single-conductor cables are made for Y-connected grounded neutral circuits up to 60,000 volts, 60 cycles, and the three-conductor ones up to 33,000 volts, 60 cycles.

The capacity of the cable shop is indicated by the amount of materials used weekly. This totals 300,000 lb. of lead, 300,000 lb. of copper and 150,000 lb. of miscellaneous metal, such as steel strip for armor, etc.



GENERAL ELECTRIC CABLE SHOP AT SCHENECTADY EQUIPPED WITH MOST MODERN CABLE-MAKING APPARATUS

United Electric Publishes "Red Band"

An article on page 1151 of the Dec. 3 issue of the ELECTRICAL WORLD stated that a quotation relative to business conditions had been taken from the *Red Band*, the house organ of the Ohio Electric Company, Cleveland. This house organ is published by the United Electric Company, Canton, Ohio.

The American Battery Company has changed its location to 2,053-7 North Racine Street from 1,134 Fulton Street, Chicago. This company manufactures storage batteries, storage-battery equipment and home electric lighting apparatus.

The Sunbeam Electric Manufacturing Company, Evansville, Ind., has an order for 100 locomotive headlights and turbo-generators from the Baldwin Locomotive Works in Philadelphia.

S. and H. Lippman, who have managed the Reliable Electric Motor Company, 165 Grand Street, New York City, for the past twelve years, have entered the electrical supply field with Max Lippman, under the name of the Reliable Electrical Supply Company, at the same address.

The Combustion Engineering Corporation, 43 Broad Street, New York City, announces the opening of two branch offices, one at 216 Latta Arcade, Charlotte, N. C., in charge of T. E. Nott, and the other at Seattle, Wash., where it is represented by the Fryer-Barker Company, 1133 Henry Building.

The Universal Electric Bracket Company, 1109 Pine Street, St. Louis, has been organized to manufacture on a large scale a recently developed device for lighting brackets consisting of a joint with metal and insulation so arranged that all wiring in the joint is eliminated. The device is finding application in a number of plants, particularly in the shoe industry. H. Scharff is manager of the company.

Candy & Company, 401 North Paulina Street, Chicago, have purchased the property of the Dearborn Truck Company, 2515 West Maplewood Avenue, which includes a three-story factory, 110 ft. x 118 ft. This building will be ready for occupancy about Jan. 5, when Candy & Company will use it for making insulating materials.

The Welborn Corporation, incorporated under the laws of Delaware for $4,000,000, has been organized. The corporation has acquired the patents, good will, plant and equipment of the Coleman Tractor Company, and also the patent on a new storage-battery electrolyte. Headquarters of the company will be in Kansas City, Mo. The officers are Frank I. Welborn, president; Earl L. Wood, vice-president and Arthur Coleman, secretary.

The Hub Electrical Supply Company, 558 Melrose Avenue, New York, has acquired the three-story building at 616 Courtland Avenue, and alterations and improvements are under way to adapt the building to the needs of a jobber of electrical supplies. Announcement was also made that the retail business of the company would be discontinued at once in order to permit entire attention to be devoted to jobbing. The company may be addressed in care of Martin Newman.

The Standard Electric Manufacturing Company, manufacturer of schedule material, is now occupying its new building at 941 Wrightwood Avenue, Chicago. This company was formerly at 216 North Clinton Street, Chicago.

The G-A Ball Bearing Manufacturing Company, 3051 West Lake Street, Chicago, has purchased a site, 124 ft. x 324 ft., at 3305-35 Harrison Street, on which it is erecting a one-story factory and office building to contain 22,000 sq.ft. and cost $50,000.

Foreign Trade Notes

DEMAND FOR INSULATED WIRE IN CHILE.—According to Consul D. C. McDonough at Concepcion, Chile, insulated wire is one of the principal articles containing rubber which are imported into that part of the country. Formerly it was imported principally from Germany, but now it comes mainly from the United States, although Japanese insulated wire is entering the market and competition is keen. Some English wire and cable is also imported directly by the West Coast Cable Company and Chile Telephone Company, Ltd. (both English). The Chile Telephone Company controls most of the telephone business in Chile and makes its purchases through its office in London, which buys from both England and the United States. The company neither buys nor sells insulated wire in Chile. The insulated wire used in Chile is not of the best quality. Both the English and the Japanese wire are of too good quality for this market. The kind in demand seems to be procurable most easily in the United States.

PROPOSED WATER-POWER DEVELOPMENTS IN ITALY.—The Provinces of Venezia, Treviso, Belluno, Padova, Rovigo, Vicenza and Ferrara, *Electrical Industries* states, are by a decree appearing in the *Gazette Officiale* authorized to form an autonomous group for the utilization of the hydraulic forces of the hydrographic basins of the Brenta and the Piave Rivers and their tributaries, as well as the other water courses of the provinces. The bodies entitled to form part of the group include the various communes, reclamation and irrigation consortiums, chambers of commerce, savings banks, the Instituto Federale di Credito pel Risorgimento delle Venezie and other public bodies and companies. The group will construct electric plants and distribute and sell electricity.

ELECTRICALLY OPERATED FLOODGATES TO BE INSTALLED IN INDIA.—Details of electrically operated floodgates to be erected at Hyderadad Deccan, India, in connection with a storage reservoir now being built on the River Musi, have been received by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. This project is to prevent the recurrence of floods like that in 1908, when the unusual rains caused the river to overflow its banks and inundate one-fourth of the city of Hyderadad. The giant shutters to be installed will so control the discharge from the reservoir that the maximum carrying capacity of the river below cannot be exceeded. Further particulars in regard to this project may be obtained from the electrical equipment division of the Bureau of Foreign and Domestic Commerce by referring to Exhibit File No. 39,353.

ITALY'S WATER-POWER PROJECTS.—Italy is in a position to dispose of numerous easily exploited water powers in her Alps and Apennine Mountains, according to advices received from a foreign correspondent to the ELECTRICAL WORLD. If up to the present time, three years after the close of the war, nothing has been done in this respect, the fault, it is declared, may be laid at the door of the Italian government, which has displayed a certain shortsightedness. While in Switzerland, for instance, the federal and various local governments have built a great number of the most important electric power stations of the country, in Italy all electric works are private property, the government tendering only slight financial assistance, and this only from time to time. The chief cause, however, for the paralysis in the Italian central-station industry is the fear of foreign capital, including French, Swiss and American, that the government will pass a proposed law surrounding the issue of shares with certain disadvantageous conditions. For this reason foreign capitalists are very chary about putting their money into these projects, however great the natural advantages seem to be. As a matter of fact, these fears are in a way unfounded, for the draft of the bill applies only to the case of speculative securities and not to industrial capital, to which the electrical stocks belong. Be this as it may, foreign capital is alarmed even at the prospect of these industrial securities being dealt with on the public exchanges, which might lead to their being considered speculative paper. The same reason prevents the Italian capitalists from investing their large profits of the last few years in these domestic undertakings, and thus this capital is lost not only to the Italian electrical industry but even to the state, for a great deal of it is now being invested in industrial enterprises operating outside of Italy. The Chamber of Deputies is to assemble at Rome during the first part of December, and it is expected that it will make a final decision on the compulsory legitimation bill. Another proposed law will be acted on at the same time the effect of which will be to prohibit foreigners from being members of the management or board of directors of any Italian hydro-electric power company. The passage of this bill also would tend to keep foreign capital out of Italian hydro-electric developments.

ELECTRICITY FOR SMALL TOWNS IN AUSTRALIA.—Arrangements are being made by the St. George County Council, according to the *Industrial Australian and Mining Standard*, for the loan of £100,000 for the installation of an electric light and power plant to supply electricity for the municipalities of Rockdale, Bexley, Kogarah and Hurstville, on which work will begin at an early date.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

A commercial corporation in Spain (No. 381) desires to secure the representation of manufacturers of electrical apparatus for the sale of electric fans, irons, ovens and grills, heaters and vacuum cleaners.

A merchant in Italy (No. 386) desires to purchase or secure an agency for the sale of electrical supplies, technical supplies, etc.

A merchant in Italy (No. 390) desires to purchase or secure an agency for the sale of electrical supplies.

New Apparatus and Publications

UNDERFEED STOKERS.—The Sanford Riley Stoker Company, Worcester, Mass., is distributing a circular covering the "Riley" underfeed stokers, safety shearing pin, moving grates, rocker dump and two-speed gear box.

WIRING DEVICES.—"Weber Wiring Devices" is the title of the 1921 catalog issued by Henry D. Sears, general sales agent, 80 Boylston Street, Boston, covering the wiring devices manufactured by the Weber Electric Company, Schenectady, N. Y.

STOKERS.—The Roach Stoker Company, 221 South Fifteenth Street, Philadelphia, is distributing a booklet describing the "Roach" stoker. The company has also issued a pamphlet covering the "Simplex" type of the Roach stoker.

CENTRIFUGAL PUMPS.—The Wheeler Condenser & Engineering Company, Carteret, N. J., has issued catalog 108-C, covering its centrifugal pumps, including double-suction, single-stage horizontal and vertical types and multi-rotor types for every purpose.

FLOODLIGHT PROJECTORS.—The Reflector & Illuminating Company, 565 West Washington Street, Chicago, has issued bulletin No. 10, describing its "Flood-O-Lite" projector. The bulletin also contains a table showing the light flux at various distances away from the projector.

SHOWCASE LIGHTING.—The National X-Ray Reflector Company, Chicago, has developed a small spotlight for showcases which concentrates the light of a 250-watt lamp at any angle desired. It can be attached to a 3½-in. shade holder of the regular window reflector or bolted to any supporting surface. The spread of the light can be adjusted from the outside, and color mediums can also be used.

WASHER AND WRINGER.—The Star Washing Machine Company, 644 West Jackson Boulevard, Chicago, has recently developed a new electric washer and wringer, known as the "Silver Star."

REFRIGERATOR.—The Utility Compressor Company, Harper and Rivard Streets, Detroit, has recently placed on the market the "Utility" electric refrigerator.

EXHAUSTER.—The L. J. Wing Manufacturing Company, 352 West Thirteenth Street, New York City, has recently brought out an exhauster "Wing-Scruplex," adaptable to any hood or system of ductwork.

MOTOR-DRIVEN PUMP UNIT.—Burleigh, Morrison & Gowing, 80 Boylston Street, Boston, have recently placed on the market a small motor-driven pump unit under the name of the "Washerpump."

WASHER.—A new electric washer, under the name of "Rightway," has recently been placed on the market by the American Gas Machine Company, Albert Lea, Minn.

MOTOR STARTER.—An automatic direct-current motor starter for small motors has recently been developed by the Automatic Reclosing Circuit Breaker Company, Columbus, Ohio.

BATTERY RECHARGING CLIP.—The Du Chanois Electric Company, Youngstown, Ohio, has recently brought out a battery "Tiger" recharging clip.

ELECTRICAL SUPPLIES.—Harvey Hubbell, Inc., Bridgeport, Conn., is distributing a four-page circular calling attention to the Hubbell "Te Tap Ten" display container, which holds ten standard Hubbell electrical specialties.

INSULATED BRUSH AND SCOOP.—The James B. Prouse Company, 37 North Sixth Street, Philadelphia, is distributing a leaflet describing its insulated brush and insulated scoop.

WIRING DEVICES.—The Beaver Machine & Tool Company, Inc., 625-643 North Third Street, Newark, N. J., is distributing a ten-page folder describing its "Beaver" switch plug, "Feed-thru" switches, couplings, etc.

New Companies

THE ROCK CREEK (OHIO) ELECTRIC LIGHT & POWER COMPANY has been incorporated with a capital stock of $15,000 by H. M. Ackerman and others, to operate an electric power plant.

THE AMERICAN ELECTRIC EQUIPMENT COMPANY has been chartered under the laws of the State of Delaware, with a capital stock of $2,000,000, to manufacture electric light, gas and other fixtures. The incorporators are Frank Jackson, W. I. N. Lofland, Mark W. Cole, Dover, Del.

THE GREENE TOWNSHIP ELECTRIC COMPANY, Chambersburg, Pa., has been organized with a capital stock of $5,000, to operate a light and power system in Chambersburg. J. G. Schaff is treasurer.

THE FAYETTEVILLE (PA.) ELECTRIC LIGHT & POWER COMPANY has been organized to operate a light and power system in Fayetteville. H. G. Sollenberger is treasurer.

THE A. P. MERCHANT COMPANY, Boston, Mass., has been incorporated by Alfred P. Merchant, Gloucester, Mass.; Frank W. Johnson, Milton, Mass., and P. L. Troy. The company is capitalized at $100,000 and proposes to manufacture electrical appliances.

THE BUGBEE BATTERY COMPANY, Trenton, N. J., has been organized with a capital stock of $20,000 to manufacture electric batteries and other electrical equipment. The incorporators are Newton A. K. Bugbee, Alvin Bugbee and Robert H. Steele, 265 Rutherford Avenue, Trenton, N. J.

THE PORCELAIN APPLIANCE CORPORATION has filed articles of incorporation at Dover, Del., with a capital stock of $25,000, to manufacture and deal in electrical appliances. The incorporators are J. H. Parker, Parkersburg, W. Va.; H. R. Holmes, East Liverpool, Ohio, and H. G. Spencer, Carey, Ohio.

THE ILLINOIS POWER COMPANY, 414½ East Washington Street, Springfield, Ill., has been incorporated with a nominal capital stock of $1,000 to furnish electricity for light, heat and power in the vicinity of Springfield. The incorporators are William B. Jess, Arthur D. Mackie and Philip B. Warren, all of Springfield.

THE CONSUMERS' HEAT & POWER COMPANY, Lilly, Pa., has been organized to operate a light, heat and power system in Lilly. W. L. Piper is treasurer.

THE GEM ELECTRIC COMPANY, El Paso, Tex., has been incorporated with a capital stock of $30,000 by John Blake, S. A. Milliron and August Albrecht.

THE MOULTON (TEX.) LIGHT & ICE COMPANY has been organized with a capital stock of $30,000 by F. T. Fehrenkamp, Edward Boehn and J. T. Jaeggle.

THE PEOPLES ELECTRIC SUPPLY COMPANY, 36 West Lake Street, Chicago, Ill., has been incorporated by D., Joseph H. and P. Landerman. The company is capitalized at $50,000 and proposes to manufacture and deal in electrical devices, etc.

Record of Electrical Patents

Notes on United States Patents

(Issued Nov. 8, 1921)

1,396,335. CONSTANT-SPEED VIBRATING MOTOR AND METHOD; Leslie R. McDonald, Montreal, Que., Can. App. filed Dec. 28, 1916.

1,396,336. DIRECT-CURRENT VIBRATORY MOTOR; Leslie R. McDonald, Montreal, Que., Can. App. filed Dec. 28, 1916.

1,396,337. VARIABLE AMPLITUDE OF VIBRATION-MOTOR AND METHOD; Leslie R. McDonald, Montreal, Que., Can. App. filed Dec. 29, 1916. Means for regulating speed.

1,396,350. ELECTRICAL MEASURING INSTRUMENT; Leon T. Wilson, West Somerville, Mass. App. filed April 19, 1920. Alternating current of high frequency.

1,396,370. CLOCK-CONTROLLED ELECTRIC SIGNAL SYSTEM; John F. Hielscher, Seattle, Wash. App. filed April 2, 1918. For automatically controlling call-bells.

1,396,374. ELECTRIC FURNACE; Walter Lohrey, Bloomfield, N. J. App. filed May 21, 1921. Alloying magnesium and other metals.

1,396,390. SEPARATOR FOR STORAGE BATTERIES; Charles F. Williams and Ira C. Williams, De Long, Ind. App. filed May 15, 1918. Strong and impervious to acid.

1,396,415. IDENTIFICATION OF PLATES AND FILMS; Julius Fried, New York, N. Y. App. filed May 1, 1920. X-ray photography.

1,396,426. ELECTRICALLY OPERATED BRAKE; Edward V. Hartford, Deal, N. J. App. filed Aug. 27, 1914. For automobiles.

1,396,434. METAL BOX OR RECEPTACLE FOR ELECTRICAL SWITCHES; Bryson D. Horton, Detroit, Mich. App. filed Feb. 15, 1919.

1,396,451. BRUSH HOLDER; Lawrence A. Merk, Los Angeles, Cal. App. filed April 11, 1921. Used in a confined space.

1,396,521. DYNAMO-ELECTRIC MACHINE; Romaine W. Myers, Oakland, Cal. App. filed Nov. 26, 1918. Slot-closing device.

1,396,525. COIL RETAINER FOR DYNAMO-ELECTRIC MACHINES; H. Pieper, Liège, Belgium. App. filed Nov. 12, 1917. Wires formed corresponding to outline of slot.

1,396,538. PROTECTIVE DEVICE; Beverly L. Stemmons, Charlotte, N. C. App. filed May 20, 1918. Spark gap which will discharge at dry arc-over voltage setting independent of weather conditions.

1,396,551. ELECTRICAL TRANSFORMER FOR REGULATING OF VARYING THE VOLTAGE OF THE CURRENT SUPPLIED THEREFROM; Frederick E. Berry, Hayes, England. App. filed Oct. 31, 1918.

1,396,552. VOLTAGE-CONTROLLING MECHANISM; Pierre Bossu, Neuilly-sur-Seine, France. App. filed Sept. 28, 1918. Applicable to dynamos.

1,396,559. PROTECTIVE DEVICE; Elmer E. F. Creighton, Schenectady, N. Y. App. filed Jan. 10, 1918. Lightning arrester.

1,396,563. ELECTRICAL APPARATUS; Guiseppe Faccioli, Pittsfield, Mass. App. filed Oct. 11, 1916. Large transformers.

1,396,571. RADIO RECEIVING SYSTEM; Alfred N. Goldsmith and Julius Weinberger, New York, N. Y. App. filed Sept. 13, 1918. Duplex system.

1,396,579. INDUCTION MOTOR; Tatsuichiro Isono, Tokyo, Japan. App. filed May 24, 1919. Combination of wound secondary and cage secondary.

1,396,582. REPULSION MOTOR; Willem C. Korthals-Altes, Schenectady, N. Y. App. filed Feb. 13, 1918. Improved control for starting, stopping and dynamically braking.

1,396,597. ELECTRICAL APPARATUS FOR HEATING LIQUIDS; Harold C. Sanders, Newport, Wales. App. filed July 27, 1920. Bare resistance wire.

1,396,654. LIGHTING FIXTURE; Earl B. Newman, Findlay, Ohio. App. filed Nov. 6, 1919. Portions exposed to view constructed of wood.

1,396,660. SANITARY MOUTHPIECE FOR TELEPHONE TRANSMITTERS; William H. Palmer, Cleveland, Ohio. App. filed Sept. 18, 1920.

1,396,677. ELECTRIC ROTATING FURNACE; Cornelius E. Cornelius, Stockholm, Sweden. App. filed March 27, 1920. Melting zinc powder into liquid zinc.

(Issued Nov. 15, 1921)

15,228. AUTOMATIC TRUNKING SYSTEM; Franklin J. Truby, Chicago, Ill. App. filed Aug. 30, 1916. Non-numerical trunking switch.

1,396,728. UNREELING AND TENSION DEVICE; Penrose E. Chapman, St. Louis, Mo. App. filed April 24, 1917. For unreeling wire to wind armatures, etc.

1,396,739. TELEPHONE-EXCHANGE SYSTEM; Clarence B. Fowler, New York, N. Y. App. filed Sept. 30, 1920. Common and local battery lines at central office.

1,396,741. MACHINE-SWITCHING TELEPHONE SYSTEM; Charles L. Goodrum, New York, N. Y. App. filed Oct. 31, 1919. Trunking arrangements.

1,396,745. VACUUM-TUBE CIRCUITS; Arthur Haddock, East Orange, N. J. App. filed May 19, 1919. Multistage amplifier.

1,396,746. TELEGRAPH SYSTEM; Carl Halter, Chicago, Ill. App. filed Dec. 22, 1917. Correcting devices.

1,396,747. TELEPHONE RECEIVER; Henry C. Harrison, New York, N. Y. App. filed Sept. 10, 1918. Improved magnetic structure.

1,396,750. SIGNALING GENERATOR; Owen E. Hill, New York, N. Y. App. filed Dec. 4, 1916. For telephone systems.

1,396,760. SIGNALING CIRCUIT; Kenneth S. Johnson, Jersey City, N. J. App. filed Jan. 4, 1918. Subscriber's telephone station.

1,396,771. RECEIVER SHIELD; John P. Minton, East Orange, N. J. App. filed March 27, 1918. For shielding from extraneous noises.

1,396,786. SYSTEM FOR TRANSMISSION OF INTELLIGENCE; Edward O. Scriven, New York, N. Y. App. filed Nov. 6, 1916. By high-frequency oscillations.

1,396,800. TESTING SYSTEM; Ray S. Wilbur, Lyndhurst, N. J. App. filed Dec. 28, 1918. Signaling over telephone circuits.

1,396,803. ELECTRIC INDICATOR; Frank W. Wood, Montclair, N. J. App. filed Aug. 7, 1919. Rotating transmitter and indicator.

1,396,812. SYSTEM OF CONTROL; J. A. Clarke, Jr., Edgewood Park, Pa. App. filed Nov. 4, 1918. Automatic acceleration of railway motors.

1,396,813. ELECTRIC AIR HEATER; Ora A. Colby, Irwin, Pa. App. filed April 4, 1919. Rods of solid conducting material.

1,396,826. ELECTRICAL DISTRIBUTING SYSTEM; Charles LeG. Fortescue, Pittsburgh, Pa. App. filed May 2, 1917. Phase-modifying means.

1,396,835. ELECTRICAL SYSTEM; Edward A. Hanff, Irwin, Pa. App. filed Oct. 14, 1916. Starting of electric motors.

1,396,838. DAMPING WINDINGS FOR DYNAMO-ELECTRIC MACHINES; Rudolf E. Hellmund, Swissvale, Pa. App. filed July 6, 1917. To reduce liability to flashovers.

1,396,839. HIGH-VOLTAGE DIRECT-CURRENT SYSTEM; Rudolf E. Hellmund, Swissvale, Pa. App. filed Sept. 10, 1917. Inherent overload protection of generators.

1,396,853. ELECTRICAL SYSTEM; Edwin S. Lammers, Jr., Wilkinsburg, Pa. App. filed Nov. 7, 1916. Used with hoists or rolling mills.

1,396,857. CAP FOR ELECTRIC LIGHT SOCKETS; Alexander W. Limont, Bridgeport, Conn. App. filed Aug. 26, 1915.

1,396,866. SYSTEM OF CONTROL; Harry R. Meyer, Wilkinsburg, Pa. App. filed Nov. 4, 1918. Electric railway motors.

1,396,871. EXPANDED-METAL RESISTOR AND METHOD OF MAKING THE SAME; Harry C. Nagel, Wilkinsburg, Pa. App. filed March 7, 1919. Metal simultaneously cut and stretched.

1,396,897. CONDENSER; Phillips Thomas, Edgewood Park, Pa. App. filed Oct. 8, 1917. Insulation of stacked-foil condensers.

1,396,898. REGULATING SYSTEM; Allen A. Tirrill, Pittsburgh, Pa. App. filed Sept. 19, 1918. Vibrating-contact type.

1,396,919. AUTOMATIC OPERATION OF ELECTROLYTIC CELLS; Porter H. Brace, Pittsburgh, Pa. App. filed Nov. 20, 1919. Production of metals from fused salts.

1,396,920. METHOD OF MEASURING CONCEALED OBJECTS; Edward E. Brostrom, Los Angeles, Cal. App. filed Jan. 17, 1920. X-ray.

1,396,928. TROLLEY POLE; Arthur W. Carroll and George P. Stoddard, Seattle, Wash. App. filed March 9, 1921. Trolley-wire replacer.

1,396,930. SYSTEM FOR THE EQUALIZATION OF TRANSMISSION LINES; Bancroft Gherardi, Bayhead, N. J. App. filed Dec. 27, 1917. Characteristics of telephone lines equalized.

1,396,947. DYNAMO-ELECTRIC MACHINES; Vincent G. Apple, Dayton, Ohio. App. filed Feb. 14, 1918. Improved end plate.

1,396,948. COMMUTATOR BRUSH; Frank L. Cooley, Brooklyn, N. Y. App. filed Jan. 6, 1921. Body of metallic fibers.

1,396,957. DENTAL WAX-WARMING DEVICE; Jay A. Heidbrink, Minneapolis, Minn. App. filed Nov. 19, 1919.

1,397,007. CARD-PUNCHING DEVICE; August Knistrom, Binghamton, N. Y. App. filed Dec. 12, 1919. Combination with ordinary typewriter of punching attachment.

1,397,008. METHOD OF PREPARING FINELY DIVIDED METALS; Albert McGall, New York, N. Y. App. filed Sept. 16, 1918. In non-oxidized condition.

1,397,034. TELEPHONE-EXCHANGE SYSTEM; Henry P. Clausen, Mount Vernon, N. Y. App. filed July 19, 1910. Machine switching.

1,397,040. CABLE SPLICE; James F. Dillon, Crown City, Ohio. App. filed Feb. 24, 1919. Strip of metal bent to embrace overlapping ends of cable.

1,397,093. RADIO REPEATING SYSTEM; Lloyd Espenshield, Hollis, N. Y. App. filed Sept. 27, 1919. For amplifying at intermediate points.

1,397,137. PORTABLE TELEPHONE APPARATUS; Alexander Miclaush, Mattoon, Ill. App. filed Oct. 5, 1918. Easily carried about.

1,397,183. DRY BATTERY AND PROCESS OF MANUFACTURE; Otto E. Ruhoff, Madison, Wis. App. filed Nov. 14, 1918. Rapid construction.

1,397,212. ELECTRIC CANDLE SOCKET; Max Herskovitz, Chicago, Ill. App. filed May 1, 1919.

1,397,222. ELECTROLYTIC REFINING OF TIN; Frank C. Mathers, Bloomington, Ind. App. filed Oct. 11, 1918. From impure cast anodes.

1,397,228. ELECTRICAL MEASURING APPARATUS; Harry Nyquist, Tabor, N. J. App. filed Sept. 3, 1920. For comparing magnitude and phase relationship.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

PORTLAND, ME.—The Cumberland County Power & Light Company is considering the construction of an auxiliary steam power station on the site of the old dry dock near the Portland Bridge, to cost about $500,000.

PORTLAND, ME.—The William Underwood Company, 50 Fulton Street, Boston, Mass., contemplates the construction of a seven-story packing plant, with power station, pier and pier house, in Portland.

KEENE, N. H.—The installation of an ornamental lighting system in Keene is under consideration. Walter R. Kirk is chairman of a special committee.

BURLINGTON, VT.—Steps have been taken for the installation of an ornamental lighting system on Church Street.

HOLYOKE, MASS.—The extension of the electrical transmission lines to West Holyoke is under consideration. John J. Kirkpatrick is manager of the Holyoke municipal gas and electric light plant.

LONSDALE, R. I.—A contract has been filed by the Blackstone Valley Gas & Electric Company with the Public Utilities Commission for the erection of a transmission line from the Hazle Street substation in the Fairlawn district to the Lonsdale plant. The contract provides for the purchase of electrical energy from the Rhode Island Power Transmission Company, Pawtucket, and the New England Power Company, Worcester, Mass., for transmission by the Blackstone Valley Gas & Electric Company.

WARWICK, R. I.—The West Warwick Town Council has appointed a committee to ascertain the cost of the installation of an ornamental lighting system in the business section of that town.

Middle Atlantic States

BUFFALO, N. Y.—The construction of a steam power house to provide service for the county jail and other buildings is under consideration by the Board of Supervisors, Buffalo. William F. Waldow is county sheriff.

LANCASTER, N. Y.—Plans have been prepared by the Depew & Lancaster Light, Power & Conduit Company for the erection of a 12-mile transmission line, to cost about $25,000. A. R. Tremaine, 173 Central Avenue, is engineer.

PLEASANTVILLE, N. J.—Bids will be taken at once, it is reported, by the Penn Motors Corporation, 1714 North Broad Street, Philadelphia, Pa., for the construction of a one-story automobile manufacturing plant, 50 ft. x 300 ft., with power house, at Pleasantville, N. J. Charles H. Donehower, Pleasantville, is engineer.

HARRISBURG, PA.—Plans are under consideration by the Board of Directors of the Harrisburg Hospital for the construction of a new power plant, with ice-manufacturing and cold-storage plants, in connection with proposed additions to the institution, to cost about $900,000, including site.

PHILADELPHIA, PA.—The Producers' Cold Storage Terminal, Inc., 1214 Widener Building, contemplates the construction of an ice and cold storage plant, 90 ft. x 275 ft., at Water and Swanson Streets, to cost, including machinery, about $1,000,000. Bids, it is understood, will be asked for the proposed work about Jan. 1, 1922. Andrew J. Sauer, Denkla Building, is the architect. C. P. Sharpless is president.

PHILADELPHIA, PA.—Bids will be received at the office of William S. Twining, director Department of City Transit, 1211 Chestnut Street, Philadelphia, until Dec. 20, for electrical equipment for the substations on Cumberland Street, east of Kensington Avenue, and on Griscom Street, north of Arrott Street. (Contract No. 637, Frankford Elevated Railway.)

PITTSBURGH, PA.—The West Penn Railways, which controls the West Penn Power Company, has taken over the West Virginia & Maryland Power Company, recently organized to supply electricity for lamps and motors in Grafton, W. Va., and eastward through Taylor and Preston Counties in West Virginia, and Garrett County, Md., into the coal fields along the upper Potomac. Work has been started on transmission lines into this territory, extending from the present system of the West Penn Power Company to Kingwood and as far south as Tunnelton, Rowlesburg and Newburg, on the main line of the Baltimore & Ohio Railroad. Additional transmission lines will connect with the larger power plant of the Monongahela River Power & Railway Company, just below Fairmont.

DELAWARE CITY, DEL.—The plant and property of the Delaware City Light & Water Company have been purchased by Daniel Hoch, William P. Bowman and Charles D. Buckley, representing the bondholders' protective committee, Reading, Pa.

FAIRMONT, W. VA.—The Monongahela Power & Railway Company is considering extensions and improvements to its electric power plants and system.

HILLSVILLE, VA.—The Skaags Brothers Electric Company contemplates the construction of a hydro-electric plant on Little Reed Island Creek, consisting of a dam 22 ft. high and 225 ft. long and a power house, 14 ft. by 18 ft., to cost about $25,000. A transmission line, 2½ miles long, to connect Hillsville and vicinity will be erected. The equipment will include two pedestal-type, 165-kva., 2,300-volt, 60-cycle alternators.

North Central States

BATTLE CREEK, MICH.—The city commission has adopted a resolution authorizing the mayor to engage an engineer to prepare plans and estimates of cost of a municipal electric light and power plant, and to submit such proposition of municipal ownership to the voters at the spring election.

GRAND HAVEN, MICH.—The Story & Clark Piano Company, Grand Haven, has had plans prepared by Byron E. Parks & Son, Grand Rapids, for the construction of a one-story power house.

LANSING, MICH.—Bids will be received by the board of electric light and water commissioners until Dec. 15 for the construction and equipment of a new municipal power plant. The initial installation will have a generating capacity of 10,000 kw. O. E. Bulkeley is superintendent of the board.

TOLEDO, OHIO.—Bids will be received by the Board of Commissioners of Lucas County, at the office of the County Auditor, Court House, Toledo, until Dec. 29, for furnishing material and labor for rewiring of various buildings at the Lucas County Home.

MONTICELLO, IND.—Plans are under way by the Indiana Hydro-Electric Power Company, Indianapolis, recently organized with a capital stock of $5,000,000, for the construction of the first of five hydro-electric generating plants on the Tippecanoe River. The proposed plant, which is to be built at Norway, near Monticello, will cost about $1,000,000, including machinery. Subsequent plants, all to be tied in with a transmission system, will be erected at Oakdale, Springboro and Tioga, with final site to be selected. Samuel Insull, president of the Middle West Utilities Company, Chicago, is president of the new company, and Harry Reid, president of the Interstate Public Service Company, Indianapolis, Ind., is vice-president and general manager.

SHELBYVILLE, ILL.—The city council is having plans prepared for the construction of a power house in Shelbyville, to cost about $75,000. Fuller & Beard, Chemical Building, St. Louis, Mo., are engineers.

GREEN BAY, WIS.—The Fort Howard Paper Company has awarded general contract to Ludolf M. Hanson Company, Green Bay, to design, construct and equip a new three-story-and-basement paper mill, 100 ft. x 120 ft., to cost about $125,000. The work includes a separate power plant and boiler house. A. E. Cofrin is general manager.

MAYKING, WIS. (Antigo P. O.)—Plans are under consideration by the C. and R. J. Wunderlich Company, Antigo, for rebuilding electric light plant and dam. The cost is estimated at $50,000.

ST. PAUL, MINN.—The Midwest Power Company has been organized to take over the property of the General Utilities Company. The management will be under the Savage & Winter Company, Pioneer Building, St. Paul. The only improvement contemplated by the new company is the erection of a high-tension transmission line from the city of Devils Lake to Devils Lake a distance of about 4 miles. This is a correction of the item regarding the reorganization of the General Utilities Company which appeared in the issue of Nov. 19.

CORNING, IOWA.—Bids will be received by the city council early in January for the construction of a one-story municipal electric power plant, to cost about $60,000. C. K. Munns, Corning, is engineer.

EMINENCE, MO.—Plans are being prepared by the Western Tie & Timber Company, Syndicate Trust Building, St. Louis, for the construction of a hydro-electric plant on the Current River at Eminence.

FERGUSON, MO.—The Republic Photographic Company, Kansas City, Mo., contemplates the construction of a power house in connection with its new plant, 77 ft. x 163 ft. and 54 ft. x 256 ft., in Ferguson, which will cost about $250,000. Albert F. H. Seelig, 2194 Railway Exchange Building, St. Louis, is engineer. E. B. Fish is president.

JAMESPORT, MO.—Bonds to the amount of $25,000 have been voted for the erection of 17 miles of transmission lines.

MOUNTAIN GROVE, MO.—The Mountain Grove Creamery, Ice & Electric Company is planning to build a dam on the North Fork River to furnish electricity in Mountain Grove and other towns. The project includes the erection of a transmission line from Gainesville to Mountain Grove, a distance of 37 miles.

OSCEOLA, MO.—H. O. Smith of Springfield, Mo., is considering the construction of a power plant, to cost about $150,000.

ST. LOUIS, MO.—Bids, it is understood, will soon be received by the Polar Wave Ice & Fuel Company, Grand and Olive Streets, for the construction of a two-story ice-manufacturing plant on Gravois Avenue, to cost about $500,000, including machinery. H. G. Clymer, Wainwright Building, is architect.

MOOREFIELD, NEB.—A petition is being circulated requesting the village board to call a special election for the purpose of submitting to the voters the proposal to issue bonds for a municipal electric light plant.

Southern States

CHARLOTTE, N. C.—The Board of Education is planning the installation of a machine and mechanical shop in the proposed three-story high school, 215 ft. x 270 ft., to cost about $300,000. A power plant and cold storage department will also be installed. Bids, it is understood, will be received about Dec. 15. Lockwood, Greene & Company, 101 Park Avenue, New York City, are architects and engineers.

ATLANTA, GA.—The Fulton Bag & Cotton Mill Company, 10 South Boulevard, has engaged J. E. Sirrine & Company, engineers, Greenville, S. C., to prepare plans for the construction of a power plant.

SPRINGFIELD, GA.—Plans are being prepared by the Savannah Battery Company, 207 West York Street, Savannah, for the construction of a municipal electric light plant in Springfield.

MIAMI, FLA.—The City Council is considering the installation of a lighting system on Ocean Drive from First Street to Biscayne Avenue.

SEBRING, FLA.—The purchase of the local electric light and water plant is reported to be under consideration by the City Council.

LEPANTO, ARK.—Plans are under way for the installation of electric light, water and sewer systems in Lepanto. Machinery, including a 50-kw. and a 100 kw. generator, oil engine, tanks, motors, pump and air compressor, will be required. J. Paul Gaines, 206 Falls Building, Memphis, Tenn., is engineer.

NEW ORLEANS, LA.—Arrangements are being made by the New Orleans Railway & Light Company for an appropriation of $1,000,000, most of which will be used to purchase new electric generating and other power plant machinery.

BOLEY, OKLA.—The installation of an electric light system to cost about $25,000, is under consideration by the Council.

LUBBOCK, TEX.—Plans are under consideration by the Texas Utilities Light & Ice Company for rebuilding its electric power and ice-manufacturing plants, recently destroyed by fire. The loss is estimated at $100,000.

Pacific and Mountain States

CAMAS, WASH.—The local substation of the Northwestern Electric Company, Portland, Ore., was recently destroyed by fire, causing a loss of about $75,000. The plant, it is understood, will be rebuilt. S. C. Carlton is local manager.

SEATTLE, WASH.—A permit has been filed by the Northwestern Power & Manufacturing Company, New York Building, Seattle, for the construction of a hydro-electric generating plant at Lake Crescent and Lyre River, Clellam County, to cost, including machinery, about $400,000.

McMINNVILLE, ORE.—The city of McMinnville has been granted permission by the State Engineer for the development of a water project, including the construction of a reservoir on the Nestucca River and Walker Creek; tunnel and pipe line about 5 miles long, and a power house on Panther Creek to cost about $250,000.

MERCED, CAL.—The Merced Irrigation District contemplates the development of an irrigation and hydro-electric project at Exchequer on the Merced River, for which $12,000,000 have been authorized. The scheme includes the construction of a storage dam at a cost of $3,763,000 and a power house to cost $2,000,000. The power developed will be sold to the San Joaquin Light & Power Corporation, under a contract which has already been approved by the State Railroad Commission.

OROVILLE, CAL.—The Great Western Power Company has plans under consideration for the construction of a hydro-electric plant near Oroville, to cost about $2,000,000.

SAN BERNARDINO, CAL.—The Santa Fe Railroad Company, Los Angeles, is having plans prepared for the construction of a steam-driven electric power house at San Bernardino, to cost about $200,000. H. S. Wall, mechanical superintendent of coast lines, is in charge.

Canada

CHATHAM, ONT.—The Township Council of Harwich has entered into contract with the local Public Utilities Commission for the erection of a transmission line from Chatham through Kent Centre to Harwich.

LONDON, ONT.—Surveys are being made by the township authorities for an electric lighting and power distribution system to cost about $30,000. J. N. Wilson, 190 University Avenue, Toronto, is engineer.